DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

APRIL, 1949 VOLUME 47 • NUMBER 4

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Published Monthly by

FINISHING PUBLICATIONS, INC.

founded 1903 as
Metal Industry Publishing Co., Inc.
11 West 42nd St. New York 18, N. Y.
Telephone: PEnnsylvania 6-0226

Branch Offices

Chicago 11
612 N. Michigan Ave.
WHitehall 4-1920

Los Angeles 13
424 S. Broadway
MAdison 6-5421

also publishers of
Organic Finishing, monthly, $3.00 per year

Member

CCA NBP
National Conference of Business Paper Editors

Copyright 1949 by Finishing Publications, Inc. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, $4.00 and Canada $4.00 per year. Other countries $8.00. Single copies 45c in U. S. and Canada, Foreign 85c. Guidebook-Directory published as separate volume in pocket size form $1.50. 1948 edition current. Please remit by check or money order; cash should be registered.

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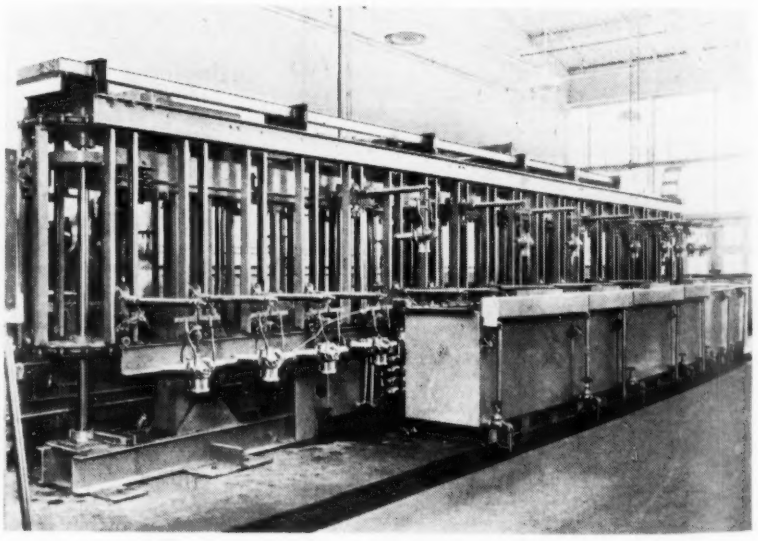

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UME 47 • NUMBER 4 • APRIL, 1949

METAL FINISHING

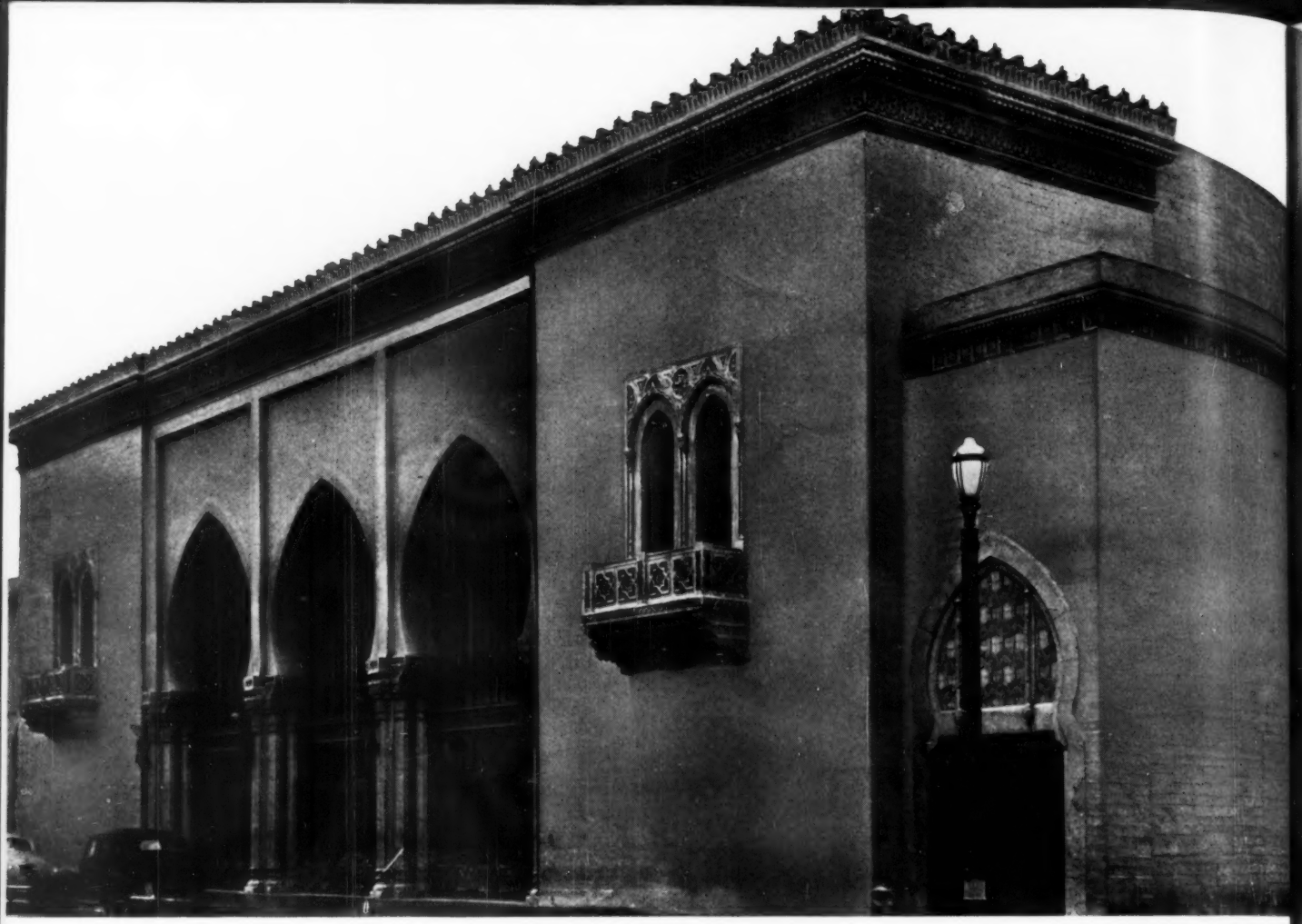
Western Metal Congress and Exposition

In recognition of the present and future importance of West Coast industry, the Western Metal Congress and Exposition will again be held, this time at the Shrine Civic Auditorium, Los Angeles, on April 11-15. This event will be sponsored by the American Society for Metals and co-operating technical groups. The show will give visitors the opportunity of examining first hand the products, equipment, and techniques used in the metal working field in their most up-to-date form.

To most Easterners (to West Coast residents this includes anyone living east of the Pacific Standard Time line!) the Far West is still only a land of sunshine and oranges, of movie colonies and Reno divorces—a vacationland of swank living and ocean bathing, with perhaps a still-undiscovered gold mine or two thrown in to entice the adventurers. Seldom is it realized that during the past ten or fifteen years there has developed a scene of industrial activity that is rapidly reducing this area's dependence on Eastern and Mid-Western production facilities.

In addition to its huge aircraft industry, this section now numbers among its industrial assets a moderate-sized steel industry and a substantial aluminum producing industry. The availability of these basic raw materials from nearby mills, with the elimination of the ever-increasing transportation charges for similar products shipped from Mid-Western mills, should promote even greater metal-working industrialization of the Pacific Coast area in the years ahead. The establishment of branch offices, warehouse and manufacturing facilities, and technical services by many of the largest suppliers of materials and equipment has played an important part in this development, and is now an established part of any national sales policy.

Metal finishing is a most important part of any such industrial growth, making the West Coast a good place on which to focus serious attention for future expansion of activities.



SHRINE AUDITORIUM IN LOS ANGELES

SCENE OF WESTERN METAL EXPOSITION, APRIL 11-15.

MORE than 100 papers on ferrous and non-ferrous products will be delivered by authoritative speakers at the Western Metal Congress and Exposition, April 11-15 in Los Angeles.

The exposition and most of the technical sessions will be held in Shrine Convention Hall. Only the morning sessions of April 11-12-13 will be presented in the Biltmore Hotel.

With approximately 200 nationally known firms exhibiting, the exposition will include displays of new and improved metals, welding and heat treating equipment, foundry supplies, inspection and testing devices and methods, machining equipment, metal cutting and tools, and metal finishing equipment and supplies.

Five national technical societies will offer programs. These are American Society for Metals, American Welding Society, American Foundrymen's Society, American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing. Approximately 15 other societies will cooperate otherwise.

ASM President

Dr. Harold K. Work, Director of the Research Div., College of Engineering, New York University. He will present a paper at the technical sessions on "Some Factors Affecting Behavior of Steel During Cold Working".

Exhibitors of metal finishing equipment and supplies are as follows:

	Booth
ACME MFG. CO. 1645 *Howard St. Detroit, Mich.* Automatic polishing and buffing equipment.	101
AMERICAN WHEELABRATOR & EQUIP. CO. 451 *S. Byrkit St. Mishawaka, Ind.* Abrasive blasting equipment.	335
G. S. BLAKESLEE & CO. 1844 *52nd Ave. Chicago 50, Ill.* Vapor degreasers.	116

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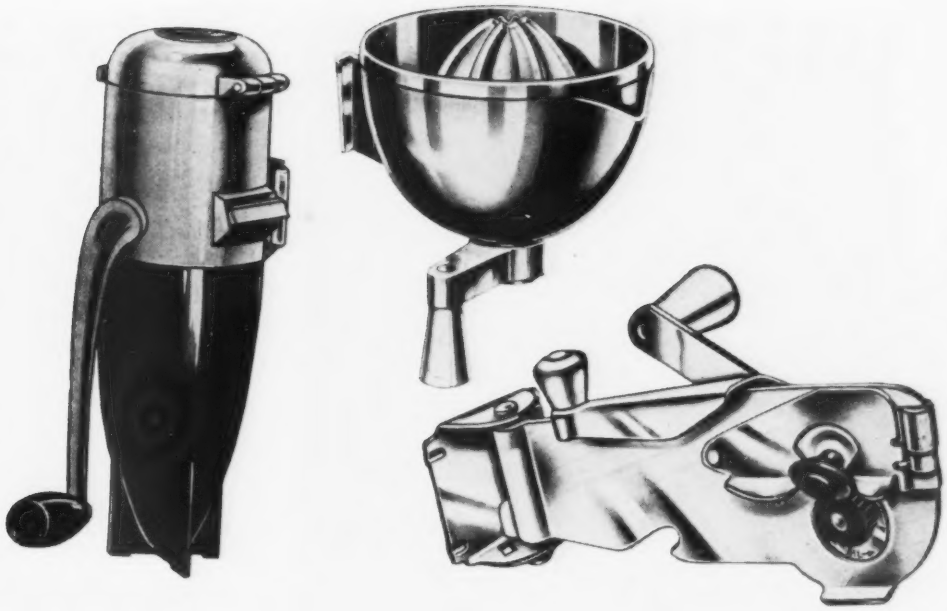


Plating Home Appliances at Dazey Corp.

By Frank Bradley

ONE of the country's leading producers of kitchen appliances and time-saving devices for the household is the Dazey Corporation, of St. Louis, Mo. The firm was founded in 1906 and was originally known as the Dazey Churn Mfg. Co. From a one product company the firm has expanded until their line includes many household appliances, principle of which are the various types of can openers widely used throughout the nation, and which help to save many a lacerated finger and frayed temper for both the new bride and the experienced housewife. Can opening is an American family tradition, and the Dazey Corp. has contributed in no small measure towards making it a pleasureable task.

Mr. Dale Bolyard, supervisor of the Dazey Corp. plating operations.

In the production of this diversified line, the company operates one of the most modern and completely equipped plating and finishing departments in the country. About a million dollars was spent in the building and equipping of the department with the most modern facilities, and for economy and efficiency of operation their layout would be hard to improve upon. Supervision of the department is managed by *Mr. Dale Bolyard*, who was formerly plating supervisor for the U. D. Hershey Corp., and the Knapp-Monarch Company.

The building itself is designed to insure adequate ventilation and lighting. Suction fans are strategically placed overhead to maintain a clean atmosphere in the department. A high ceiling, with windows around three of the walls and several skylights in the roof, permits enough natural light to enter so that working conditions are excellent. This is supplemented by fluorescent lighting from overhead fixtures at critical spots. Electric hoists are used abundantly throughout the shop for lifting, moving, and transferring work into or out of the various processing baths. A specially-laid acid resisting floor runs under the plating room, and acid-proof paint is applied to the outside of all tanks to prevent corrosion from spattered or dripped acid materials.

A separate boiler is installed to provide the steam required for the various processing tanks.

In the manufacture of their products, the firm uses steel, stainless steel, aluminum, and zinc-base die castings, all of which eventually must pass through

Figure 1. Polishing and buffing department.

the finishing department. At present they do not do any plating on the aluminum or stainless parts, but the aluminum parts are phosphated before painting, while the stainless steel parts receive cleaning and passivating dips. Some work is also performed on the electropolishing of stainless parts.

Polishing and buffing are done in a separate room adjacent to the plating department. Eight operators man the four polishing lathes, as shown in Figure 1. Each part after polishing or buffing is placed on a conveyor belt that runs along the rear of each machine where it is carried to an inspector, who checks to see that the workmanship is up to the standards required. Cleanliness in this department is maintained by having a large suction fan to carry away any dirt and buffing residues from the lathes.

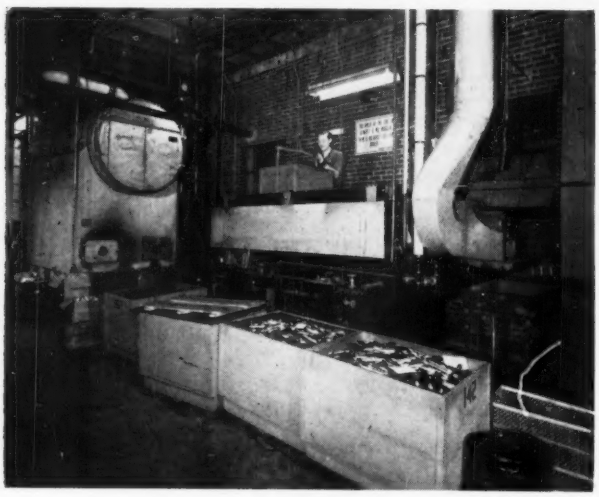


Figure 2. Degreasing parts prior to plating or other shop operations.

After polishing and buffing, the parts travel to the vapor degreaser, which is located near the entrance to the plating room where it is also convenient for degreasing other parts in process in the plant without having to move them through the plating room. An electric hoist is mounted above this machine to take the heavy lifting out of the job and also to control the speed of withdrawal of the parts from the machine, saving on the quantity of solvent used and helping to prevent the escape of trichlorethylene vapors into the surrounding atmosphere.

Figure 3 shows the automatic nickel and chrome plating machine, through which most of the production passes. The parts are placed on suitable racks by a group of female operators (see Figure 4) and travel in a continuous cycle through the nickel and chrome cycles. No re-racking is done between the nickel and chrome, as neutralizing dips are incorporated in the cycle to prevent contamination. This automatic machine is 60 ft. long and 8 ft. wide.

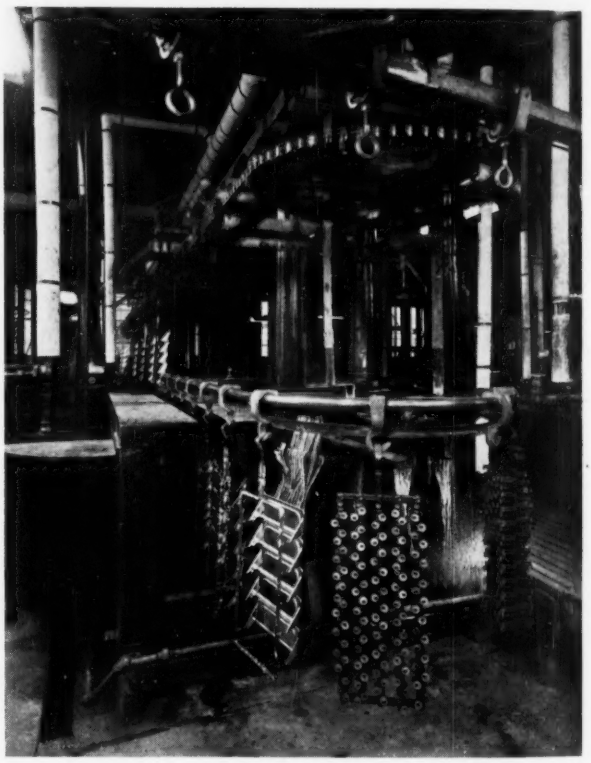


Figure 3. Automatic nickel and chrome unit.

The cycle for this machine is as follows:

1—Clean in reverse current cleaner at about 20 amps/ft.^{2}
2—Cold water rinse.
3—Dip in 20% hydrochloric acid.
4—Water rinse (cold).
5—Plate in bright nickel (organic type) at about 40-50 amps/ft.^{2} About .0006-.001″ of nickel are deposited.
6—Water rinse twice in cold water.
7—Chrome plate at 200 amps/ft.^{2}
8—Dip in water re-claim tank.
9—Rinse twice in clean water.
10—Dry in hot air dryer.

Figure 4. View of racking department. Racked parts are hung on the conveyor in the foreground and carried to the plating units.

Ordinarily steel parts travel through the plating cycle with no previous copper undercoating before the nickel deposit, but certain parts that require special finishes may be copper plated and buffed prior to this cycle. The entire automatic cycle takes about 31 minutes.

In plating die cast parts the following cycle is used:

1—Clean in a reverse current cleaner.
2—Water rinse.
3—Dip in a 10% proprietary dip (acid).
4—Water rinse.
5—Copper strike in a Rochelle type cyanide bath.
6—Transfer direct to a cyanide type bright copper solution.
7—Water rinse.
8—Dip in 1% sulfuric acid.

Figure 5. Automatic cadmium plating unit.

9—Water rinse.
10—Transfer to automatic nickel and chrome conveyor, where they go through the same cycle listed above.

An automatic cadmium plating unit is also used in the plating room for handling small interior parts. This is supplemented by three cadmium barrel plating tanks for parts adaptable to barrel plating. Figure 5 shows the automatic cadmium unit and Figure 6 shows the cadmium barrel set-up. The cycle in the automatic cadmium line is as follows:

1—Clean in a reverse current cleaner at 20-40 amps/ft.^{2}
2—Water rinse.
3—Dip in 40% hydrochloric acid.
4—Rinse twice in water.

Figure 6. Barrel arrangement for cadmium plating small parts.

5—Cadmium plate, usually at 20-40 amps/ft.^{2} Approx. .0003"-.0005" of cadmium are deposited.
6—Water rinse twice.
7—Bright dip.
8—Water rinse twice.
9—Dry in hot air dryer.

The entire cycle takes about 20 minutes.

The barrel cycle for cadmium is very similar, except that the reverse current cleaning is replaced by a straight soak clean in alkaline cleaner. The work is transferred through the various baths by means of the overhead hoists. A dip in cyanide just prior to the plating operation is also incorporated in the barrel line. It takes about 30-45 minutes in the plating tank to deposit from .0002"-.0004" of cadmium.

Phosphating parts prior to painting is also done in the plating department, the layout for this process being shown in Figure 7. Ten minutes are allowed for steel and about five minutes for other metals in the phosphating bath. Here again overhead hoists take much of the heavy work out of the activities.

Parts which are hung on the automatic plating conveyors are returned to the racking department after plating, where the same operators remove the parts

(*Concluded on page 59*)

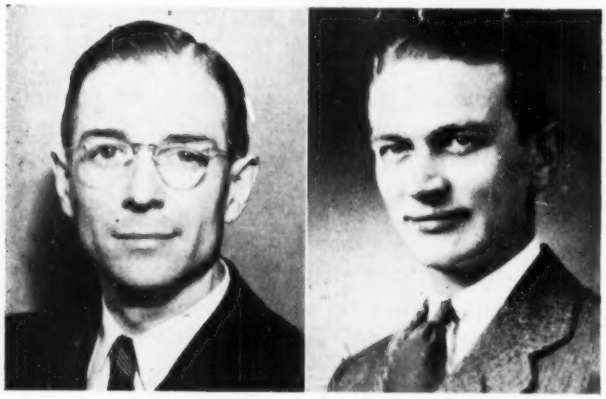
Sodium Silicates in Metal Cleaning

By Clinton W. MacMullen and Clarence G. Ozar, *Cowles Chemical Co., Cleveland, O.*

THE use of sodium silicates in the metal cleaning field is a comparatively modern development, and yet surveys indicate that 60% of the total tonnage of proprietary electrocleaners contain silicates. In this most critical of metal cleaning jobs, silicates have proven their worth as detergents, since their acceptance on a cost basis alone, as compared to soda ash or caustic soda, could not be justified.

Because silicated products have consistently produced metallic surfaces adjudged satisfactory for the use intended, sodium silicates have found increasing acceptance in metal cleaning solutions. To the metal finishing trade, such over-simplification may appear inadequate even though cleaners are almost exclusively accepted or rejected on the basis of final results. In view of the multitudinous variations due to soils, metals, processes, conditions, and procedures, it would be of doubtful expediency, however, to generalize about metal cleaning unless a common ground of general agreement is defined.

Therefore, if we consider soils as matter out of place, then soil removal is the interaction and/or assimilation of such matter by a detergent, thereby effecting a change of environment. Such soils may be gaseous, liquid, or solid, and their affinity for a metal surafce may be due to one or several of a variety of surface phenomena such as molecular forces, electrostatic charges, mechanical attraction, Van der Waals adsorption, and chemisorption. The measure of the effectiveness of a detergent, or the detergent *potential*, would be the degree to which it can neutralize or make inoperative such forces, and displace the soil from its state of repose. With constant operating conditions, such as time, temperature, concentrations, current density, agitation, etc., the detergent potential would be dependent on the individual or collective properties exhibited by the constituents of the detergent in solution.



Clinton W. MacMullen Clarence G. Ozar

Clinton W. MacMullen received his B.Ch.E. and Ph.D. degrees at the University of Minnesota. For eight years he was a research chemist at Rohm and Haas Co., where he developed surface active agents, detergents, and bactericides. Since 1943, *as Technical Director of Cowles Chemical Co., he has carried out research on the development of detergents and cleaners for the metal finishing industry.*

Clarence G. Ozar is a graduate of Detroit University in Chemical Engineering. He also did graduate work in Physical Chemistry. Formerly associated with the National Tube Co. at Lorain, Ohio, as Metallurgist and Chemist, he has since 1944 *been in charge of the metal cleaning service laboratory of Cowles Chemical Co.*

Most of the early work on sodium silicate solutions was done on the more siliceous (high silica ratio) silicates, which have extremely limited application in metal cleaning, and is of interest here only because many properties peculiar to such solutions are still attributed to all soluble sodium silicate solutions.

Hydrolysis of Silicates

In elucidating the constitution of sodium silicate solutions, early investigators[1] contended that hydrolysis in dilute solutions was practically complete, yielding sodium and hydroxyl ions and colloidal hydrous silica, and that the colloidal silica particles were generally nagatively charged, migrating to the anode upon electrolysis. This served to explain the high conductivity of dilute sodium metasilicate solutions since it was assumed that the sodium and hydroxyl ions carried the current. Later investigators modified this concept by showing that the amount of hydrolysis was quite low, that there were less hydroxyl ions formed than previously thought, and that there was a high degree of ionization in dilute solutions with the production of a fairly mobile silicate ion. Although none of the silicates are largely hydrolyzed, hydrolysis was found to vary with the $Na_2O:SiO_2$ ratio, being more complete for the metasilicate than for the higher silica bearing silicates. Hydrolysis also varies with concentration, becoming low as the concentration rises. It was concluded that solutions of sodium metasilicate undergo both hydrolytic and ionic dissociation, giving rise to positively charged sodium ions, negatively charged hydroxyl and silicate ions and metasilicic acid, most of the latter being crystalloidal rather than colloidal. Depending upon the ratio $Na_2O:SiO_2$ and the concentration, silica exists in sodium silicate solutions wholly or partly crystalloidal, and this crystalloidal silica is in equilibrium with simple and complex silicate ions, silicate-silica ionic micelles, or pure colloidal aggregates. Furthermore it was shown that, at metal cleaning concentrations, the greater percentage of total sodium in sodium metasilicate solutions exists in active ionic state.

Whatever the exact nature of the silica particle in solution (colloid, ion, complex ion or ionic micelle) there was, previous to a few years ago, almost general concurrence of opinion that such particles were negatively charged and therefore, upon electrolysis, migrated towards the anode to produce an anodic film. It was also known that the negative charge could be reduced and even reversed by the addition of acid, and that the negatively-charged colloidal particles would adsorb upon their surfaces positively charged ions present in solution. It was well known however, that because of its highly adsorptive characteristics, a film-free metallic surface was a practical impossibility[2], so the metal cleaning industry was not perturbed by the knowledge that silicates would produce a film. However, the plater, though steadily tending toward increased use of anodic cleaning, was insistent in his demands for a loosely defined "chemically clean" surface, holding as inconsistent that such a surface should be filmed, in many instances making silicates particularly suspect. The literature is replete concerning this film, its nature and mode of deposition. Though inferences are numerous as to its harmful effects, there is nowhere offered reliable supporting evidence that such a film was a significant or sole cause of unsatisfactory electrodeposition.

Resolution of the dilemma of surface films on metals after electrocleaning was contrived a few years ago by investigators[3] who offered conclusive evidence, specific to the electroplating industry, of the production of surface films by all the common alkalies. These studies, using electron diffraction methods, left nothing to doubt in establishing the presence of both anodic and catholic films. Of far greater importance, however, was the fact that most of the films were identified chemically. The observations relative to sodium metasilicate indicate—contrary to all previous theories—that anodic films deposited from the electrolysis of such solutions did not contain silicates or silica. In fact, these films, identified as gamma Fe_2O_3 or Fe_3O_4, were identical to that produced from a caustic soda solution. However, the sodium metasilicate did produce a cathodic film singular to such solutions—a combination of ferrous-ferric oxide and hydrated silicon dioxide. This film of iron silicate, being highly acid-soluble, does not represent any plating problem. The observations indicated that there was no silicate present on the surface after a subsequent acid dip. As to the constitution of sodium metasilicate in solution, the investigators concluded that it was a solution of dehydrated silicon dioxide in caustic soda, in which the colloidal agglomerate is positively charged.

Though the exact nature of sodium silicate solutions is still open to controversy, the final clarification is only of academic interest to the metal finishing industry, since the disagreements are of little consequence relative to the detergent potential of sodium metasilicate solutions. Of that which is held in mutual agreement, there is little that can be construed as detrimental to a metal cleaning procedure, and much that can be reckoned as beneficial. This has been amply proven in the shop, as well as in the laboratory. Suffice to say, from the foregoing review of the constitution of silicate solutions, we can assume with little chance of equivocation, that sodium metasilicate dissociates hydrolytically in solution, to a greater or lesser degree, to produce ions and electrically charged colloidal agglomerates or micelles in a strongly alkaline solution. Also, similar to other alkalies, cathodic and anodic films are formed when such solutions are electrolyzed. Both of these films are readily soluble in subsequent acid dips and, therefore, represent no plating problem. Furthermore, it can be assumed that the effects in cleaning processes other than electrolytic will be analogous, though modified; and, finally, that orthosilicate and sesquisilicate (the higher caustic-ratio silicates) will exhibit similar behavior.

Cleaning Zinc Base Alloys

Zinc and zinc-base die castings can be successfully cleaned in sodium metasilicate solutions, and conflicting reports on the use of silicate cleaners were reconciled by *Hazel & Stericker*[4] who showed that good results depended upon the choice of the proper ratio Na_2O:SiO_2 silicate, and specified the limits for anodic (reverse) electrocleaning. Cathodic (direct) electrocleaning may be carried out over a much wider range of concentration, temperature, and current density than anodic (reverse). Sodium metasilicate and sesquisilicate may be used advantageously in 3% solutions at 195° F. and a current density of one ampere per square decimeter for anodic (reverse) cleaning of zinc and zinc-alloy die-castings, whereas under the same conditions the more siliceous (di-and tri-) silicates give heavy white deposits on the anode. Thus the formation of anodic deposits is not dependent on silica content but on the Na_2O:SiO_2 ratio in the silicates employed.

The metal finishing industry, to attain full economic maturity for its constant, inevitable succession of refined techniques and improved processes, has had to rely on the ability of the metal cleaning manufacturer to stay abreast of these demands for better and faster-acting detergents. To do so, the metal cleaning industry introduced silicates to improve detergency of the then available alkalies against soils of increasing complexity and difficulty of removal. Formulating on the basis of effectiveness and cost, these same manufacturers have attested to the wisdom of this decision by steadily increasing silicated formulations, until today approximately 75% of the proprietary alkaline metal cleaners offered to the metal finishing trade contain silicates. It is not difficult to understand why this should be if the properties of silicates are examined in the light of their application under the anticipated conditions confronting a metal cleaner.

Advantages of Silicates

Silicates are unique among the common alkalies in that their solutions approach true colloidal electrolytes in their characteristics, dissociating hydrolytically, to produce colloidal agglomerates or micelles. This is an advantage, because silicate solutions tend to stabilize emulsions, enhance deflocculation[5] and lower surface[6] and interfacial tensions[7].

If it is considered that, for the majority of alkaline metal cleaning processes, little useful work is done below a pH of 10—the point below which the action of soap is impaired—then, with the exception of caustic soda, the silicates, with their additional tendency to resist pH change, offer more active alkalinity than do the other common alkalies. Though caustic soda obtains the most active alkalinity for the least money, its detergent potential is low, since alkalinity is not the main criterion of a good detergent. Surface-active properties, and the consequent emulsification of liquids and deflocculation of solids are more significant testimony as to power of detergency.

Silicate solutions usually have lower surface tensions than the other common alkalies in equivalent solution.[6] In fact, the accelerated lowering of interfacial tension by silicate solutions has been shown[7] as the reason silicates, as compared to other alkalies, are so efficient in effecting the removal of mineral oil and prime lard oil. These surface-active properties are important in detergency for many reasons. At low values, they enable more effectual displacement of air from crevices and greater ease of soil penetration. Because they wet oil more readily, they facilitate emulsification.

If an alkaline metal cleaner is so formulated that its constituents are compatible with a solid soil, the degree of surface tension lowering between the solid phase and the aqueous phase is a measure of soil penetration. Such penetration, through the interstices of a deposit, multiplies many fold the surface area of the soil exposed to the alkaline detergent. Adsorption on these surfaces will produce oppositely charged surfaces which will repel and tend to break up the deposit and stabilize it in a colloidal form. This surface-active effect, adsorption, is exhibited to a superior degree by silicate solutions, which further enhance deflocculation —disintegration of a solid phase as contrasted to emulsification of liquids—by the micellar scrubbing action of the large mass of the colloid particle.

Other than the detergent characteristics thus far considered, silicates, as corrosion inhibitors, are used in metal cleaners compounded for use on the more active metals, especially aluminum. In this respect they are the only economical alkaline products which will clean and inhibit at the same time.

Rinsing

Many metal cleaning processes demand quite elaborate cleaning procedures, while others are extremely simple. Whether simple or complex, a metal cleaning procedure is essentially soil removal in a medium which then re-soils the work. This operation may be repeated several times, but always to the end that the final medium be compatible with subsequent processing. For the vast majority of metal finishing processes, this final medium is a water rinse. It is, therefore, requisite to efficient metal preparation that each medium produce a soil which will be effectively displaced in the next subsequent medium. Also the medium preceeding the water rines, should be of such character as to obtain maximum removal of residual soils therein, i.e. be rinsable.

Rinsing of an alkaline cleaner is primarily dilution—dilution of the alkaline phase and dilution of the oil-in-water emulsion phase—present at the metal-cleaner interface. If the emulsion phase is broken on dilution, either through the inability of the alkaline cleaner to stabilize the emulsion at low concentrations, or because the rinse water destroys the emulsifying properties of the cleaner, then the oil will be re-deposited on the work. The silicates are superior detergents in this respect, stabilizing the soil in solution and resisting re-deposition at comparatively high dilutions. It would seem logical that easily soluble alkalies would upon dilution rinse better, but this is not necessarily true, since caustic soda, though very soluble in water, is a notoriously poor rinser. This may be explained by the possible adsorption of the alkali ion on the metallic surface, thereby circumventing thorough displacement of alkali from the metal surfaces. However, there are very few spheres of thought that are subject to so many changes as are the contentions relative to the surface forces acting at a solid-liquid interface. It has been lately proposed[8] that surface effects extend beyond the mono-molecular layer, exerting their influence (sometimes by "remote control") to comparably great distances to effect the orientation of surface films. Until these things are better understood, it is hardly possible that either sound opinions or applications can be made. In any event, theories will have little influence on judgment reserved for cleaning tank results, and on this basis silicate solutions give little cause for concern. Because of their superior emulsifying and colloidal properties, and their tendency to prevent re-deposition of dirt, silicates are judged particularly easy rinsers. Inadequate rinsing facilities will, however, counteract all the good rinsing properties formulated in a metal cleaner, and it cannot be mentioned too often that metal articles can be no cleaner than the final rinse.

Summary

The foregoing discussion of the properties of alkaline silicate solutions leads to one conclusion: that they possess a high detergent potential and, therefore, deserve wide application in the metal cleaning field. It is no surprise then to find their use steadily mounting, not because these properties were found and annunciated by research laboratories, but because silicated cleaners, of which these properties are an inherent part, produced satisfactory results in practice.

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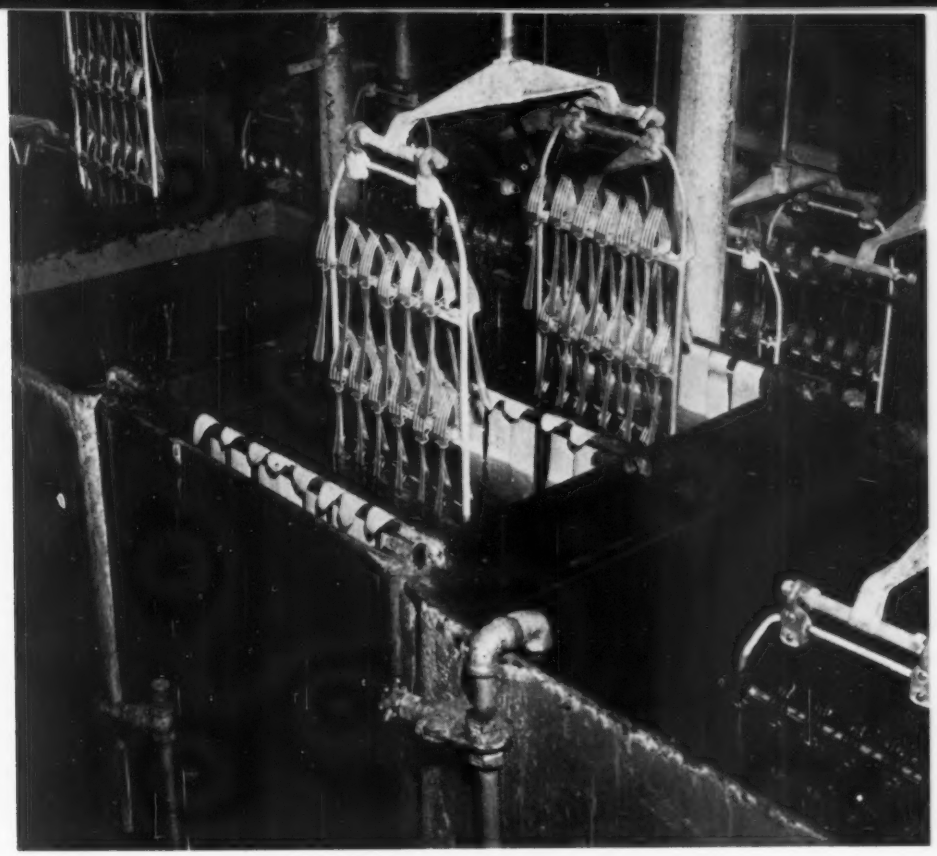


Electropolishing Silver at Oneida, Ltd.

By Daniel Gray, *Chief Chemist, Oneida Ltd., Oneida, N. Y.*

Figure 1. Hand methods of color buffing of plated silverware were expensive and dirty. Electropolishing has overcome these difficulties.

(EDITOR'S NOTE—The original article on this subject was published in the May 1947 issue of *Metal Finishing*. The great advances in technique, the numerous commercial applications, and the growing interest in the subject made it advisable to publish a revision of the article. This revision, by the senior author, touches on general theory and practice but puts special emphasis on the practical adaptions at Oneida, Ltd.)

THE process of electropolishing silver in cyanide solutions comes close to satisfying the ideals of labor and of management. It promotes cleanliness and safety and minimizes physical effort. In addition it contributes to the production of a better article at a lower cost.

The production of a smooth, lustrous surface on metals by hand buffing (Fig. 1) is slow, expensive, and dirty. It is also very uneven as regards the amount of metal removed on various areas of an irregularly shaped article. The last factor is of prime importance on thin electrodeposits.

In the case of silver, the process of electropolishing in cyanide solutions (Developed in the laboratories of *Arthur D. Little, Inc.*, under the sponsorship of *Oneida, Ltd.*) has proved its utility by reducing wheel finishing costs from 20% to 100%, depending on the class of article. The last figure may seem fantastic,

Figure 2. Final operation after electropolishing is the production of the highly desired "patine" finish by wheel methods.

but it is a fact that on costume jewelry, novelties and some special lines of silverware, wheel finishing has been entirely eliminated. On tableware, rouge buffing has been reduced or eliminated altogether. The only finishing is a light rub-color operation to produce the desired "patine." (Fig. 2) Since this is still a hand operation a large force of men and women is necessary for quantity production. In all cases noted to date there has been a saving.

In addition to the monetary saving, the quality of the finished article is improved by this process. Primary rouge buffing may remove 5% or more of the original deposit. Unfortunately this is not removed evenly from the whole surface. In trying to buff less accessible areas undue pressure may be brought to bear on other parts, particularly edges. This may result in the removal (called "line-stripping") of the entire deposit on edges or corners. Electropolishing, on the other hand, removes any desired or needed percentage of the deposit much more evenly than buffing. Consequently line stripping is reduced and the finished articles have more silver, more evenly distributed, left on them than when buffed.

General Descriptions and Theory

Electropolishing in general is based upon the fact, well known to all platers, that there is a limit to the current density at which an anode will corrode efficiently. When this limit is reached one of several phenomena may take place; the anode may become passive, gas may be evolved, or a new form of corrosion may occur whereby the surface is made smooth and lustrous.

In order to understand fully what occurs it is necessary to remember that the essential chemical and physical processes in plating occur in a very thin film of solution immediately surrounding the anode and cathode. It then becomes obvious that any projection, such as a slight nodule or sliver of metal on an anode, is more exposed to corrosion than the general surface. On the other hand a depression or pit is less exposed, and the overall tendency is to even the surface. (Fig. 3) This tendency is accentuated in certain ranges of current density known as the polishing range.

These known facts of anode corrosion have been applied in many well-known processes, particularly in the field of ferrous alloys such as stainless steel. Most of these processes use acid solutions. The use of cyanide solutions is a comparatively recent development.

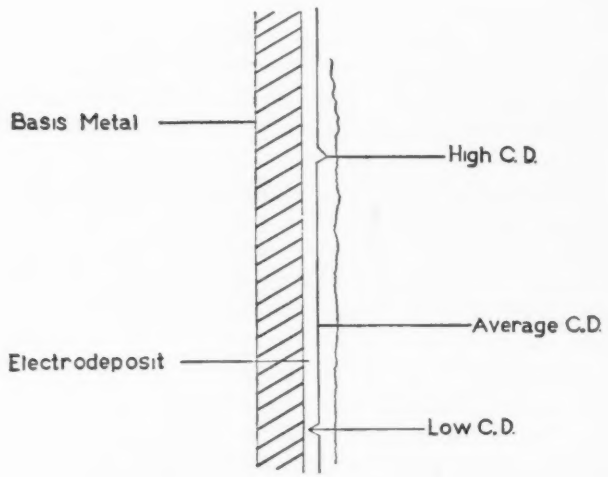


Figure 3. Diagram of current density distribution at an electrode.

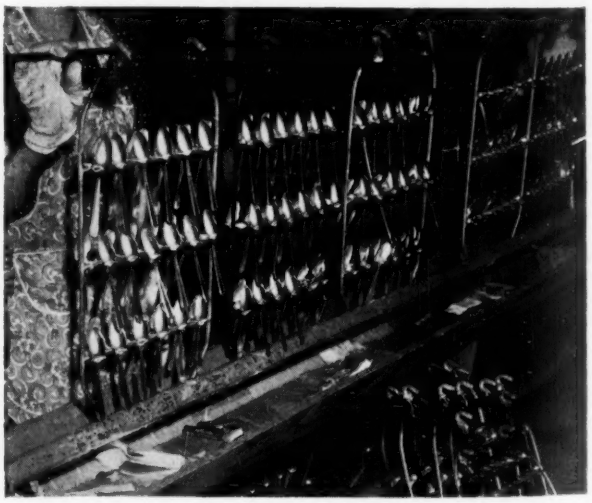


Figure 4. Final luster after electropolishing does not show up until parts are dry, as illustrated by the parts on the extreme right. The parts on the left are still wet.

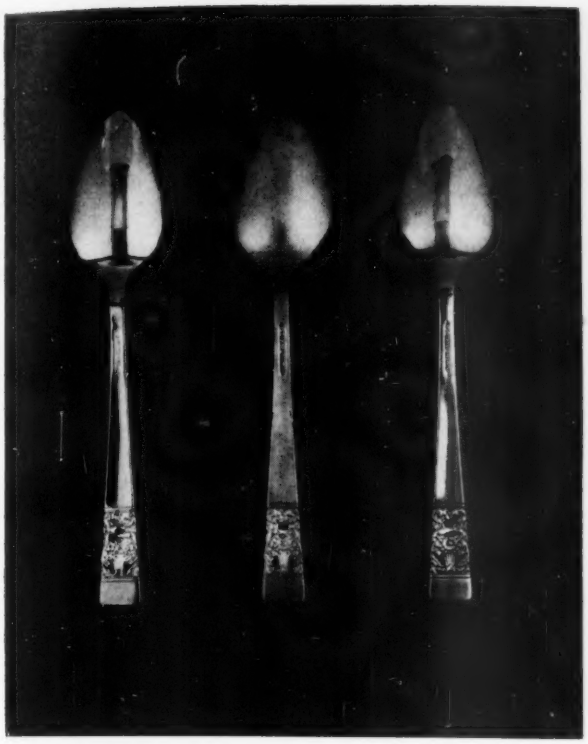


Figure 5. Illustrating the relative luster of plated spoons. The spoon on the left has been electropolished, while the right hand spoon was finished by conventional wheel methods. Center is the spoon after plating only.

Electropolishing Bath

One interesting feature of electropolishing silver in a cyanide solution is that a balanced solution gives, on the whole, best results for quick and economical action.

The solution itself is essentially a cyanide silver plating bath. Long experience has proved that the best all-around solution is a balanced one of 0.3 molar concentration as regards silver, free cyanide and carbonate. This corresponds to the following formula:

Silver (as metal)	4 oz./gal. (Troy)
Free Potassium Cyanide	2.5-2.6 oz./gal.
Potassium Carbonate	5.5 oz./gal.

Where a sufficiently long time is available for electropolishing a .15 molar solution is also good. This is made by cutting the concentration of the .3 molar solution exactly in half.

It is advisable to use both an ammeter and voltmeter in connection with the electropolishing tank. The voltage across the tank is, in general from 2.5 to 3.5 volts, but these limits may of course be extended in either direction where conditions demand.

The cathodes are preferably silver bars. The area of the cathodes should be as large as conveniently possible, at least twice that of the anodes. The object of this is to prevent as far as possible the formation of a spongy deposit. Incidentally the silver removed from the work is recovered in pure metallic form. The saving in refining charges compared to buffing dust is a considerable item.

Agitation may be of a reciprocal or straight-line type. In either case it should be smooth. If chattering is present the difficulty in maintaining the correct electrical conditions is greatly increased.

The tank should be lined with a rubber, vinyl chloride, or other materials suitable for silver cyanide baths. This prevents shorts, the effect of stray current and corrosion.

Assuming that a unit is set up in accord with the foregoing data the operation is relatively simple. The work is preferably left on the plating racks, immersed in the polishing bath at the proper voltage and allowed to remain for the required time. Where the formula of the plating bath differs widely from that of the polishing bath, the ideal set-up is to have a rinse and a pre-dip between the two. The pre-dip should be made-up and maintained at the same composition as the polishing bath.

There is a bright spot here for the small operator who cannot afford the space necessary for extra tanks. The polishing solution is itself a fairly good plating solution and it is possible to *plate and polish in the same solution*. The details have been pretty well worked out and are available to interested platers.

The great flexibility of this process may be ascribed to the simplicity of control. The vital factors of solution composition, voltage (or current), agitation, time and temperature are all measurable and can be readily controlled or varied. So far we have not discussed the time element in electropolishing. While a polishing cycle of short duration is an advantage in some cases, actually the longer time assures easier control. In practice the time may vary from one second to two or three minutes.

As indicated previously, where mere "glitter" or brightness is the only requisite, no further finishing is necessary. On heavy deposits and on articles requiring a toning down of luster the important effect of electropolishing is the production of a *smooth* surface. Any buffer or finisher knows the importance of this.

At this point a word of warning may be in order. Anyone starting "cold" on this process, even though he follow directions to the letter, will probably be amazed at the erratic and oftentimes inferior results

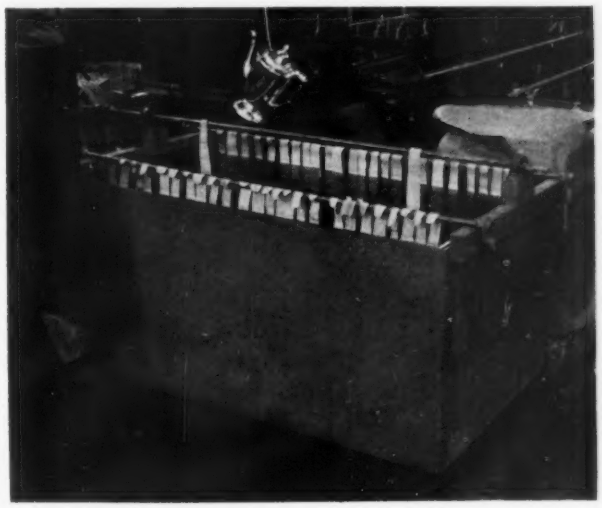


Figure 6—Electropolishing tank for holloware.

Figure 7—Electropolishing of holloware is also possible. Pieces on the right above have been plated only, those on the left have been electropolished after plating.

obtained. While the general process is simple, the basic factors involved are extremely complex. They can be mastered by long experience or quickly through expert instructions.

Process Used at Oneida, Ltd.

The particular adaptation of the process used at Oneida, Ltd., is well suited to deposits of about .002" or less. The essential flexibility of the process is evidenced by the fact that some units are installed on automatic machines built long before electropolishing was dreamed of.

Spoons, forks and other articles are mounted in racks and conveyed through a typical cleaning and plating cycle. After plate they go into the electropolishing unit, which is simply a converted rinse tank. See photo at the beginning of this article. The applied voltage at the source is about 5 volts. The actual cell voltage varies from 2.5-3.5 depending on the area of the work in process. The current density is from 10 to 25 amps. per sq. ft. The rate of movement of the work through the bath is about 18 inches per minute and the actual polishing time 15 to 20 seconds. The full luster on the work is not evident until dry (Fig. 4). The difference in reflectivity between a plated, an electropolished and a conventionally finished spoon is shown in Fig. 5.

Figure 8. Pre-plate finishing department at Oneida, Ltd.

Since there is no rinse or pre-dip on some units the drag-in of silver plating solution changes the composition of the polishing bath rapidly and necessitates frequent analysis and adjustment.

Holloware plating is not done on automatic plating machines. In this instance a separate electropolishing unit is set up. The polishing time is from 60 to 75 seconds. The effect achieved on the highly irregular shapes and surfaces is well illustrated in Fig. 7, showing pieces before and after electropolishing.

Oneida, Ltd., has at the time of writing six electropolishing units. As new machines are built provision is being made for a more ideal cycle, including a rinse and pre-dip.

Figure 9. Automatic machines are utilized wherever possible for pre-plate finishing.

Finishing Before Plate

At Oneida most of the pre-plate finishing is done by hand. This requires the work of several hundred men (Fig. 8). Automatic and semi-automatic buffing machines (Fig. 9) are rapidly replacing the old method.

The principal operations are: edging with emery belts, polishing sand and the like to remove the flash left by the hammers used to stamp the design and shape the article; and secondly "black buffing" with tripoli compound. Since secondary lines get only the edging operation it is essential that top-notch dies be used with accurate setting. Experience has shown that on secondary lines it is more economical to eliminate inspection of buffing and all-over condition before plating, leaving inspection to the final stage after plating and finishing. Here each piece is inspected individually.

Following the pre-plate finishing, top-grade lines of work are cleaned in a two-phase emulsion cleaner, inspected (Fig. 10) and then moved along to the plating operations.

Factors Affecting Final Quality

The two principal factors affecting the final appear-

Figure 10. Inspection of top-quality plated ware prior to silver plating.

ance and quality of electropolished articles are the finish on the basis metal and the quality of the electrodeposit.

The amount of metal removed in most applications of electropolishing is so small that gross defects in the base cannot be eliminated nor hidden. In fact the brilliant surface produced seems to magnify and reveal such flaws. It has been suggested that advantage be taken of this fact for close inspection of the quality of pre-plate finishing.

A coarse, white, or frosty plate requires the removal of more metal than a smooth semi-lustrous one. For best results good pre-plate finishing and a reasonably smooth deposit are necessary.

Other Applications

So far only silver has been polished commercially. Other metals such as cadmium, zinc, copper, brass, pure and karat gold may also be polished. Each metal or alloy requires modifications of the solution and voltage and must be specially tailored to give optimum results. Preliminary work is best done in a pilot sized unit such as is pictured in Fig. 11.

Figure 11. Pilot plant for electropolishing studies provides important control information.

Another interesting application is in the manufacture of sterling. Flats are not only polished, but weights can be adjusted closely by control of current and time.

Notes

The process described in this article was developed in the laboratories of *Arthur D. Little, Inc., Cambridge, Mass.* It is covered by U. S. Patent 2,416,294 and others pending. All licensing and technical services are handled by *Arthur D. Little, Inc.*

PLATING HOME APPLIANCES

(*Concluded from page* 51)

from the racks, make out appropriate work records, and inspect for plating defects. The firm manufac-

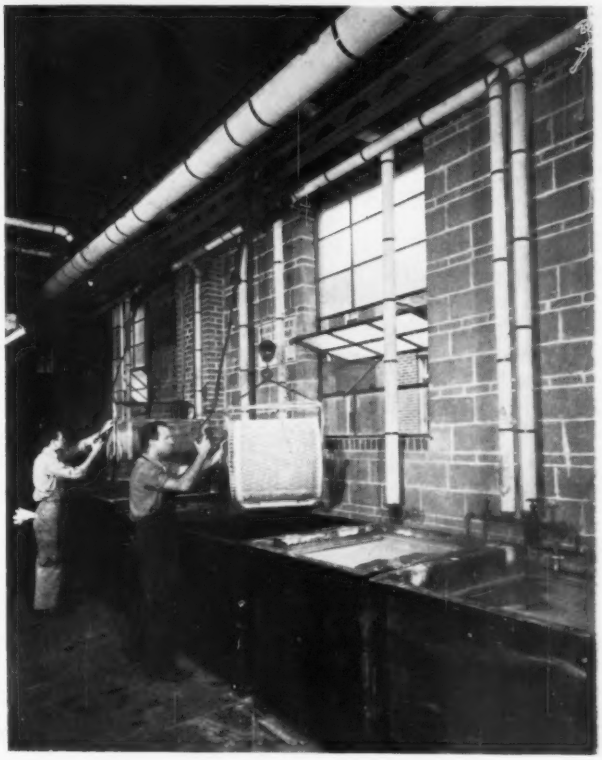


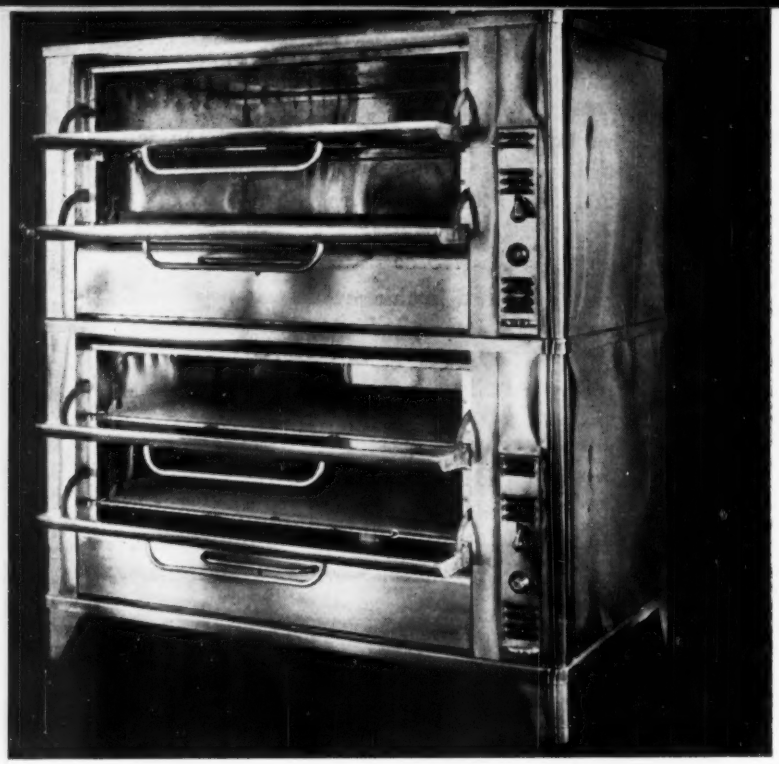
Figure 7. Phosphating line.

tures all its own plating racks and utilizes up-to-date insulating materials for coating them.

Power for the plating department is supplied entirely from rectifiers, each plating unit having its own separate power supply. The barrel line has three units of 1500 amperes capacity each; copper plating tanks have 1000 ampere and 1500 ampere units; automatic nickel and chrome machine have two 3000 amp. units and a 1500 amp. unit; cadmium automatic machine has 1500 and 1200 amp. units.

Close by the plating room is a laboratory where one man is kept constantly busy checking the plating baths and the quality of the finished work. Frequent checks are made of plating thickness, and complete facilities are available for solution analysis.

Miscellaneous equipment for the plating room also includes a filter for keeping the various baths clean. The filter has a capacity of 2000 gals. per hour, and a 3500 gallon storage tank is also provided for making up and treating the plating baths.



Finishing Monel Metal

By Edward Rosen, *Brooklyn, N. Y.*

EDITOR'S NOTE—While Monel metal is rarely plated, the methods employed for obtaining a suitable surface finish are of importance to every finishing department. In this article the author discusses in detail the various mechanical operations required to bring out the natural beauty of this versatile metal.

THE nickel-copper alloys, of which Monel is the most common, are characterized by good mechanical properties, excellent corrosion resistance and attractive natural appearance. Generally speaking, their usefulness lies in those applications where corrosion conditions prohibit the use of steels and where the other non-ferrous metals are deficient in mechanical properties and corrosion resistance characteristics.

The widespread use of Monel in a long list of industrial and consumer products has made it imperative that we understand more fully the specific methods recommended for cleaning, pickling, grinding, polishing, buffing and chemical finishing. After a short discussion of this very versatile metal, each of these important categories will be discussed in detail.

Physical Properties

Monel combines relatively high strength, ductility, toughness, and corrosion resistant characteristics with the added virtue of being a white metal which can be brought to mirror brightness. Its strength range compares favorably with some alloy steels and is well above that for common types of nickel silvers, brasses or bronzes. Its excellent ductility and high strength combine to make Monel a really tough metal, ranking among the leaders in impact tests.

Chemical Properties

Monel is resistant to corrosion by most acids, alkalies, salts, waters, food products, and organic substances, both at normal and elevated temperatures.

Subjected to indoor exposure under normal atmospheric conditions, Monel either retains its brightness or undergoes very slow fogging which can be easily removed.

Monel is resistant to sulfuric acid solutions in concentrations up to 80% H_2SO_4. Corrosion rates, at ordinary temperature, range from about 0.004" penetration per year, over a wide range of concentrations in unagitated solutions, to a maximum of about 0.04" per year in air-saturated and agitated 5 to 10% H_2SO_4 solutions, the rates being lower in more dilute and also in more concentrated solutions up to 80%. At concentrations above 80% H_2SO_4, rates are again higher.

Monel may be used with hydrochloric acid in concentrations up to about 20% in relatively quiet exposure at usual atmospheric temperature, with an expected corrosion rate of about 0.02 inches per year. Higher concentrations are strongly corrosive. Caution should be exercised in the use of Monel in contact with hot or highly aerated solutions of hydrochloric acid of greater than 2% concentration and at temperatures above 120°F. However, even under these conditions Monel is often the most economical material to use.

Cleaning and Pickling

Nickel-copper alloys such as Monel are susceptible to surface injury during heating if oil or grease from the last mechanical operation, or accumulated dirt from storage, is not removed before the metal is heated for forging or annealing. Many lubricants contain sulfur and the pigment in marking paint is generally a sulfide; it has been found that sulfur and sulfur compounds are particularly active in embrittling Monel at elevated temperatures and destroying the smoothness of the metallic surface. In fact, most

foreign matter will "burn" into the surface at high temperatures and cause difficulty in cleaning.

Among the chief sources of contamination the following are usually to be considered:

1. Heating for forging and annealing without first removing oils, greases or accumulated dirt.
2. Heating prior to the removal of sulfur and its compounds which are present in lubricants and in the pigment of marking paints.
3. Heating and cooling in poorly controlled atmosphere.
4. Discoloration from welding operations.
5. Embedded iron or steel particles.

It is the purpose of the following discussion to indicate proven methods for restoring Monel surfaces to their natural beauty in the face of a variety of conditions. It should not be assumed, however, that all the pickling operations covered below are required in Monel fabrication.

Greases and oils may be conveniently removed from Monel in the same manner that they are removed from other metals. Vapor degreasing, using trichlorethylene or perchlorethylene, has its advantages in the production line, and the high resistance of Monel to attack by dilute hydrochloric acid obviates the worry about possible decomposition of the chlorinated hydrocarbon solvents and their resultant pitting of the metal being cleaned.

With respect to alkali cleaning, a hot 10-20% solution of equal parts of sodium carbonate (or sodium hydroxide) and trisodium phosphate will remove fatty acid combinations, tallow, grease, and soluble oils, if the parts are immersed for approximately 10 minutes at a temperature of 180-200°F. Parts cleaned accordingly should be thoroughly rinsed in water. Mineral oils can be dissolved by such solvents as gasoline, kerosene, or carbon tetrachloride, but treatment with any of these solvents, as well as with vapor degreasing, should be followed by alkali cleaning and thorough rinsing in water.

The surface characteristics most likely to confront pickling personnel are as follows:

1. Tarnish.
2. Reduced oxide of spongy and lightly adherent nature.
3. Oxide film or tightly adherent scale.
4. Brown discoloration on machined parts.
5. Embedded iron particles.
6. Coppering.

The first three types of surface contamination result from heating and cooling conditions in the fabrication of the parts, while the latter three may be classified as special problems arising from causes other than heating. For each of the above conditions there is a specific pickling solution and method which will enable economical and rapid restoration of the natural surface.

Tarnish

Tarnishing most commonly occurs on drawn and spun shapes, cold-headed rivets, cold-drawn wire and other cold-worked products finished with a white surface by annealing in a strongly reducing sulfur-free atmosphere, and either cooling out of contact with oxygen, or quenching in a 2 per cent (by volume) alcohol solution. In cleaning the products included in the above group, bright dipping or flash pickling is used to remove tarnish and dullness and to give the parts a bright, lustrous, white appearance. Best results have been obtained through the use of two separate solutions.

SOLUTION A:

Nitric Acid (38° Baumé)	1 gal.
Common salt	0.5-0.75 lb.
Water	1 gal.
Temperature	70°-100°F.
Time	5 seconds (max.)
Container	earthenware crocks, glass, or ceramic vessels

SOLUTION B

Nitric Acid (38° Baumé)	1 gal.
Water	1 gal.
Temperature	70°-100°F.
Time	5 seconds (max.)
Container	earthenware crocks, glass, or ceramic vessels

Parts to be pickled are first warmed by dipping in hot water and then immersed in solution A for a few seconds. They are then rinsed thoroughly and dipped in solution B. This should be followed by a neutralization rinse in a 1-2% by volume ammonia solution, prepared by the addition of a 4-8 fluid ounces of commercial aqua ammonia in a gallon of water. Neutralization is followed by rinsing in boiling water and drying.

Solution A is also effective for the cleaning of parts preparatory to maintenance welding. Dipping procedures may be employed, but if parts are too large to permit immersion, the solution may be applied by long handled brushes or swabs. Generally one dip treatment in solution A is sufficient as a supplement

Figure 1. Mill finishing Monel metal sheets on abrasive belt grinders at the Huntington Works of the International Nickel Co.

to mechanical cleaning by grinding or abrasion with emery cloth to obtain the cleanliness required for welding. Chemically cleaned parts should be thoroughly rinsed in hot water and neutralized as indicated above to remove all traces of acid.

Reduced Oxide

Hot-worked products such as forgings and hot-rolled shapes, which are necessarily oxidized but which prior to pickling have been heated in a strongly reducing sulfur-free atmosphere and cooled out of contact with air or quenched in a 2% alcohol solution, contain a surface film of reduced oxide. This is a spongy and lightly adherent mixture of metallic nickel and copper. Hot-worked parts that are to be subsequently cold-rolled and drawn or otherwise cold-worked generally fall within this group of parts requiring pickling, as do hot-worked products which require annealing and pickling prior to shipment.

The following solution is recommended for large scale production in plants fully equipped for pickling:

SOLUTION C

Water	1 gal.
Sulfuric acid (66° Baumé)	¾ pint.
Sodium Nitrate (Crude)	½ lb.
Common salt	1 lb.
Temperature	180°-190°F.
Time	30-90 min.
Containers	earthenware crocks, glass or ceramic vessels. Wooden barrels may be employed for short time usage.

Because the efficiency of this solution is slightly higher after some use, a 2% by volume addition of spent solution may be profitably added in the preparation of a fresh solution. Pickling may be hastened by scrubbing with pumice after a short immersion and then re-immersing. Intermittent scrubbing and immersion may not be suitable on a production basis, but it can cut time appreciably when volume is small.

Figure 2. Monel sink bowls for marine use being cleaned of drawing compounds by hand.

Thorough rinsing after pickling, followed by a short dip in a 1-2% ammonia solution for neutralizing, and a final rinse, complete the pickling cycle. However, if a more lustrous and brilliant white surface is desired, parts should be pickled as described under tarnish removal.

The high corrosiveness of solution C requires that all racks, crates, wire hooks and other handling equipment be made of a corrosion-resisting material such as one containing approximately 29% nickel, 20% chromium, 3% molybdenum, 3% copper, balance iron.

Oxide Film or Scale

Oxide film or scale on Monel metal is easily identified because it presents a black or darkly colored surface, which is tightly adherent. This surface is formed most commonly on all hot-rolled and hot-formed products and on annealed pieces which have been allowed to cool in air. Descaling this type of surface requires the use of the following solutions:

SOLUTION D

Water	1 gal.
Hydrochloric acid (20° Baumé)	½ gal.
Cupric chloride	¼ lb.
Temperature	180°F.
Time	20-40 minutes
Containers	acid-proof brick-lined vessels; glass, ceramic, or earthenware crocks

SOLUTION E

Water	1 gal.
Sulfuric acid (66° Baumé)	0.1 gal.
Sodium dichromate	1.1 lb.
Temperature	70°-100°F.
Time	5-10 minutes
Containers	earthenware crocks, glass or ceramic vessels, rubber-lined tanks

Variation within the time limits specified above will naturally be dictated by the thickness and tenacity of the scale. Thorough rinsing in hot water is required after solution D and before immersing in solution E. As with the other methods discussed above, pickling is followed by rinsing and then neutralizing in a 1-2% ammonia solution.

The above pickling method is recommended for thin to moderately thick scale. Where the oxide is heavy however, an alternative procedure may be followed which will lessen the time cycle in the acid bath and therefore reduce the danger of etching

surface. Both the *Virgo** process and the *Sodium Hydride*** descaling process have been used successfully. Either of these fused salt bath processes is effective for removing relatively heavy scale when followed by water quenching and a five to ten second immersion in solution A of the flash pickling sequence described earlier. Time in the fused salt bath will vary from 10-20 minutes, depending upon the thickness of the scale.

If the scale is too thick to be economically removed by chemical means, the parts may be sand-blasted, and an attractive white surface obtained by following the mechanical operation with flash pickling. An alternative is to soak the work in the hydrochloric acid pickle, solution D, followed, if brightening is necessary, by a short dip in solution A and B.

In some instances, for example large sheets or fabricated tanks, the size of the part may not permit immersion. To overcome this difficulty, a paste pickle may be applied with a long handled brush. The following formula is recommended for best results:

SOLUTION F

Lamp black	1 lb.
Fuller's earth	10 lbs.
Hydrochloric acid (20° Baumé)	3 gal.
Nitric acid (38° Baumé)	½ pt.
Cupric chloride	1-2 lbs.
Temperature	70°-100°F.
Time	20-60 minutes

Note: The lampblack and Fuller's earth are placed in a 5 gallon crock. The acids are mixed and the cupric chloride dissolved in a separate crock or glass container. The resulting solution is poured over the powder and the whole is mixed thoroughly.

Paste pickles fume badly and must be applied in a well ventilated location. Where fumes cannot be ducted away from the workmen, diluting the acid concentration is recommended. After spreading the paste and allowing sufficient time for the reaction (dependent upon the thickness of the scale) the paste is removed by hot water hosing, and scrubbed off if necessary with sand or pumice. Hot water rather than cold water hosing is recommended since cold water may cause Monel to tarnish badly at this stage. Should it be necessary to use cold water, however, a lime paste should be applied directly to the paste pickle on the surfaces being treated and then thoroughly mixed by brush. This will result in a neutralization of the acids and prevent tarnishing. Hot water hosing does not require the use of lime.

Brown Discoloration (Machined Parts)

Previous mention has been made of the brown discoloration on Monel metal caused by the formation of sulfur compounds during high-speed machining operations. This discoloration may be removed by immersion in a sodium-cyanide solution (approximately ¾ lb. to a gallon of water). Immersion for 5-30 minutes at temperatures between 70° and 100°F. will usually do the job. Thorough rinsing in hot or cold water and drying operations should follow immediately.

Figure 3. Finished Monel galley sink bowl.

Embedded Iron or Steel

Pickling personnel working with Monel metal will occasionally face the problem of removing embedded iron particles picked up during manufacturing. If allowed to remain, these iron particles will serve as focal points for corrosion attack. If embedded particles are shown to exist they may be removed by brush application of a paste pickle conforming to the following:

SOLUTION G

Fuller's earth	10 lbs.
Lamp black	1 lb.
Hydrochloric acid (20° Baumé)	½-1 gal.
Water	½-1 gal.
Time	1-12 hours
Container	earthenware, glass or ceramic

The paste may be left on overnight, when convenient, and hosed off the next day.

For smaller parts, or for vessels which may have iron particles embedded on the interior, an immersion treatment is recommended. The following solution, followed by a warm water rinse, gives excellent results:

SOLUTION H

Water	1 gal.
Hydrochloric acid (20° Baumé)	¼ pt.
Ferric chloride	½-1 oz.
Temperature	room
Time	not more than 1 hr.
Container	earthenware, glass or ceramic vessel

Coppering

Patches of coppering on Monel may occur during pickling as the various solutions become aged. Small additions of ferric chloride or nitric acid will prevent copper deposition and reduce the necessity for its

* Patented, Hooker Electrochemical Co.
** Patented, E. I. DuPont de Nemours Co., Inc.

removal. Another cause of coppering is contact of steel with acid-wet Monel. This can be avoided by the use of Monel or nickel handling equipment. However, where preventative measures have not been adequate and patches of coppering must be removed, the recommended procedure is to immerse the parts in a room temperature aerated solution containing 1 pint of commercial aqua ammonia to a gallon of water. Normal rinsing and drying operations should follow.

Grinding, Polishing and Buffing Monel

Monel can be finished to any of the recognized finishes, from sandblast to mirror. As a preliminary to detailed recommendations, one generality must be borne in mind. Monel does not conduct heat away as rapidly as steel, copper or aluminum. Therefore, caution must be observed to avoid excessive wheel pressures during operations in order to prevent either the warping of light gauge articles or the destruction of true color in buffing.

As with other metals, a fixed cycle of operations is necessary to produce a particular finish. For the mirror finish, there are no short cuts; the base for final operations must be adequately prepared by steps in which the wheel marks of each preceding polishing operation are removed by increasingly finer grit. There is usually a jump of 30 grit numbers for each successive operation. Obviously, for satin finishes fewer operations are necessary than for bright or mirror finishes.

Another generality which applies equally as well to the finishing of Monel is that true economy is achieved through proper selection of wheels, glues and abrasive materials.

In the grinding or roughing down of welds, solid silicon carbide rubber-bonded grinding wheels are recommended. This type of wheel combines cutting effectiveness with relative softness, producing a minimum of heat during grinding. Thin Monel articles are thus safeguarded to a greater degree from warping. For fillets and curved corners, rubber bond wheels are available in cup or cone shape. For heavy welds, No. 24 grit is suggested, with the grinding wheel running in the direction of the weld, followed by cross-weld grinding with a finer abrasive. Light welds will respond to No. 36 grit. For maximum efficiency, rubber-bond wheels are operated at a wheel speed of 8,000-9,000 surface feet per minute. The general practice of weld grinding provides for the use of a six inch diameter wheel with a one inch face.

In the selection of abrasive, artificial grit is preferred to Turkish emery for grit sizes up to and including No. 120. When artificial grit becomes dull, it fractures and continually presents new and sharp cutting edges. This naturally results in greater cutting efficiency and economy during grinding operations. Turkish emery, on the other hand, dulls without fracturing and is consequently more efficient for the advanced polishing operations.

Polishing

Polishing embraces the successive steps of roughing, dry fining, greasing and grease coloring, each step producing as respective finishes—rough grind, commercial grind, fine grind and fine scratch. Set-up wheels are used for both roughing and dry fining. The most effective wheel is one consisting of quarter-inch thick sections of spirally-sewed cotton fabric that is tightly woven and unbleached. These quarter-inch sections are rubber-cemented together to make the necessary face width. The face of the wheel should have a soft cushioning effect on the work. The necessary soft face is obtained by gluing the fabric sections not closer than one half inch from the outer perimeter. For dry fining, the cushion face of the wheel should be made softer by increasing the distance of glue application from the perimeter of the wheel.

Figure 4. A special application of finishing. This plunger for the recoil cylinder of a 5" gun is being superfinished to 2 millionths of an inch by means of an oil-honing operation.

Emery grease cake is used for grinding operations, roughing requiring a No. 60 or No. 80 grit, and dry fining a No. 100 or No. 120 grit size. In both operations, the recommended wheel speed is within the 6,000-7,500 surface feet per minute range.

Greasing, which produces a fine grind finish, is done with a well worn-in wheel of No. 150 grit or No. 180 grit, clogged with low melting point tallow. The wheel used for greasing is similar in construction to that used for roughing, but is more resilient and flexible. It is made of 64-68 count unbleached sheeting, spirally-sewed sections which are glued together, with the glue between sections further from the outer perimeter than in the wheel used for roughing. During greasing, the wheel is operated at 6,000-7,500 surface feet per minute and is charged with polishing tallow or No. 180 emery grease cake to prevent glazing. Some polishers may use the same type wheel for greasing as for polishing; however, the wheels referred to above afford best results.

Grease coloring is last of the polishing steps which is necessary when a mirror finish is eventually required. Grease coloring operations employ No. 200 or No. 220 grit artificial abrasive, Turkish emery, or "F" emery grease cake. Low melting point tallow is used with the two former abrasives but is not necessary with the grease cake. Quilted sheepskin wheels or ones similar to those used for greasing, but con-

sisting of 88-88 count unbleached sheeting, are employed for grease coloring. With "F" emery grease cake a loose-disc buffing wheel can be used. Wheel speed is 6,000-7,500 surface feet per minute. Grease coloring operations roll down the surface preparatory to buffing and are similar to lapping operations.

For all the polishing operations, either headed wheels mounted on polishing stands or portable grinders, or portable grinders with special rubber sanding drums to which emery sleeves are fixed may be utilized.

Brushing and Bobbing

Brushing or bobbing is no longer considered a necessary step in the cycle of operations to achieve a mirror finish, provided the grease wheel is well broken in. However, when brushing is used as a preliminary to buffing for a mirror finish, brushing with a Tampico wheel charged with emery cake is recommended as an efficient means for smoothing down and blending previous abrasive scratches. The wheel is operated at a peripheral speed of 1,200 to 3,000 feet per minute. Tampico brushing is rapidly gaining favor as a substitute for bobbing in the pre-buffing cycle.

Brushing will also produce finishes not obtainable by emery polishing wheels; it is also a means of finishing backgrounds not accessible to emery polishing wheels. Tampico brushing with emery paste or grout will produce a scratch brush or satin finish. If pumice and water or pumice and oil are substituted for the emery or grout, Tampico brushing will produce a butler finish. Where Tampico brushing is employed to produce a final finish, wheel speed range is between 1,200 and 3,000 surface feet per minute. However, the best speed can be determined only by trial.

Wire brushing of Monel is used only in sheet metal finishing as a final operation to produce a satin, bright, wire-brush or matte finish. A hanger brush (0.004"-0.008" dia. wire) operated at a surface speed of 4,000 to 6,000 feet per minute and used either dry or with a solution of 30 AP bark and warm water will produce a satin finish. Heavier wire, operated at a lower speed, will produce a matte texture.

Wire brushing calls for several precautions. If the wheel speed is too low, coarse scratches will result. Hand-made wire brushes drawn on wooden hubs and made of "Z" nickel are recommended for use on Monel to avoid metallic tinting or the embedding of wire particles which might develop into local rust spots.

Bobbing, like brushing, may be employed either as a pre-buffing step, or as an operation designed to produce a particular finish. For a satin or butler finish on articles drawn or stamped from Monel, a walrus leather wheel is used with a pumice and oil mixture and is operated at 5,000 surface feet per minute. Where bobbing is a pre-buffing step, the compound used with the walrus leather wheel is grout. Grout is a combination of oil and emery or water and emery. It may be made by mixing one part by weight of No. 3F Turkish emery, 2 parts by weight of No. 200 grit Turkish emery and one part by weight of Venetian lime or silica flour. This dry mixture is then made into a thin paste by adding a solution of 3 parts by volume of kerosene and one part by volume of medium oil for an oil grout; or a solution of 2 parts by volume water with one part by volume of 26-28° Baumé aqua ammonia for a water grout.

Buffing

Buffing consists of two major operations—cutting down and coloring. Primarily the cutting efficiency of a wheel depends upon thread count and stiffness. Recommended for the first step of the buffing process is a pocket-type wheel which gives added stiffness, and is made of 88-88 count unbleached sheeting of loose spirally-sewed sections. An alternative is a loose-disc wheel. Either wheel, used with Tripoli compound, and operated at 8,000-9,000 surface feet per minute, will produce a bright finish sufficient to meet most decorative requirements. In order to obtain a mirror finish, coloring action is necessary. The same type of wheel is used, but is speeded up to 10,000 feet per minute. The use of aluminum oxide buffing compound (white) serves to produce an extremely bright finish; however, a mirror finish bringing out the true blue of Monel is obtained by using a loose-disc canton flannel wheel (the heavier threads aid coloring) at the same speed, with a chromium oxide buffing compound (green).

Buffing operations must be watched carefully. Wheel speeds for buffing are increased and more heat is naturally generated. For this reason, less pressure must be applied than for the polishing steps.

After buffing, the final step is hand rubbing with a canton flannel cloth charged with Venetian lime (whiting). This is also the final step for any finish ranging from rough grind to mirror luster to remove any grease from the ground, polished or buffed surface.

Special Procedures

A great deal of high luster finishing work on Monel is directly concerned with a cabinet-type of product made from special cold-rolled or standard cold-rolled Monel sheets. To achieve a high luster on special cold-rolled Monel sheets, it is often only necessary to buff with Tripoli, following by coloring with aluminum oxide or chromium oxide. A still better final finish is obtained by starting the process with a grease coloring operation before going on to buff. On standard cold-rolled sheets, the polishing sequence may start with No. 180 grit, followed by grease coloring with No. 200 or No. 220 grit, before cutting down with Tripoli and coloring with aluminum or chromium oxide. Satisfactory finishes have also been obtained by substituting Tampico brushing for the Tripoli operation. Whenever possible, the first polishing operation on standard cold-rolled sheets should utilize nothing coarser than No. 180 grit size. Coarser grit may pit the Monel sheets, although such pitting will not become evident until the buffing stage of operations is reached.

A satin finish is obtained on standard or special cold-rolled sheeting by cutting down with a No. 180 or No. 200 fine emery grease wheel followed by Tampico brushing. Wire brushing for satin finish is best applied to ornamental castings.

Tin Plating by Immersion Solves Difficult Problem

COPPER pipe, widely used as plumbing in residences and industry, is also an important part of electric water coolers for drinking water. A major disadvantage of copper tubing for such an application is that with some waters corrosion products dissolve in the water and cause it to turn greenish in color. As copper plumbing became more and more popular this problem assumed major proportions to manufacturers of water containing and processing equipment. Tin coating the tubing was a known solution to this problem.

Previous to the development of the immersion process for tin coating the insides of copper water tubing, however, it was difficult, if not impossible, to get a good tin job on the inside of a tube or pipe. Electroplating was impractical because there was no satisfactory way of getting the plating to "throw" inside the tubing due to the small diameter and long length of tubing invloved. Hot dipping was impracticable for the same reasons, and in any case had to be done by a very awkward method. The larger diameter tube stock was hot-tin dipped and then redrawn to the size desired, by the tube mills. This drawing often cracked the tin coat and sometimes wiped it off in places.

To overcome these problems, the *Ebco Manufacturing Co.*, of Columbus, Ohio, spent considerable time and money to develop a suitable tinning process

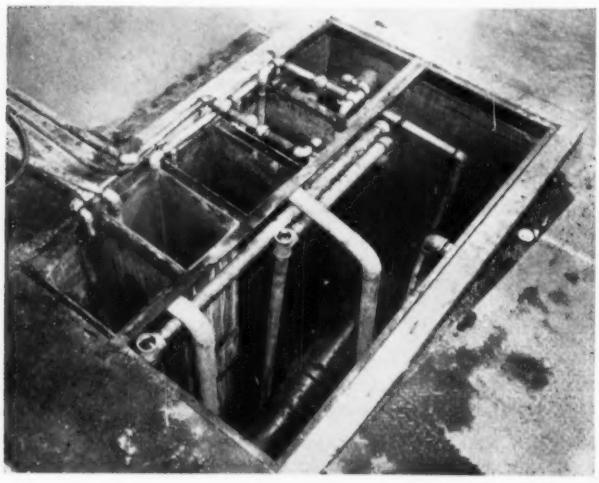


Figure 1. Arrangement of treating tanks for the immersion tinning of long copper tubes.

Figure 2. Workmen unloading a shipment of soft copper tubing preparatory to tinning the interior surfaces.

for the coating of long lengths of copper tubing used in their line of electric water coolers. The cold immersion process finally worked out was the result of research and development at Battelle Memorial Institute by *John D. Sullivan* and *A. E. Pavlish.* Early last year construction and installation of the production equipment was inaugurated at the Ebco plant.

With this new immersion method of tinning, the inside of pipe could be plated completely and satisfactorily.

The immersion tinning process also lends itself to tinning threads and machined parts more readily than does the other methods. Hot tin proved to be impractical for these purposes because of the uneven coating left on the parts. Electrotinning was especially unsatisfactory for Ebco products because of the small opening sizes in tubes and the crooked and irregular cavities in brass cast or forged parts.

The first step in the installation of equipment for the new cold tin plating process was the excavation of a pit. The dimensions for this pit were 11′ 4″ deep, and four feet wide by six feet in length. Following the completion of the excavation, the sides and bottom of the pit were completely cemented and the tanks for the cold tin plating process were then fitted into position. See Figure 1. Each of these tanks has a capacity of 105 gallons. The first tank contains the cleaning solution, the second is a rinse (hot water—212°),

the third contains the tinning solution, which is maintained at room temperature (approximately 65°) and the fourth tank is another hot water rinse maintained at boiling.

After the tanks were installed, steel plates were placed over the balance of the opening and a drying cabinet was added in the upper left portion of the pit. This drying is the last step in the cold tin plating process and consists of drying the plated pieces by means of hot air maintained at a 100°F temperature.

Since Ebco, the world's largest manufacturer of electric drinking water coolers, is primarily interested in the inside of tubings and castings, the cold tin plating process has proven to be ideal for their use. *Louis P. Benua*, General Works Manager, explained that several cubic feet of castings or many hundred feet of tubing could be put in a basket and dipped in the solutions, and that an excellent job was produced on the inside. If some of the outsides touch each other and leave small spots where no tin is applied, the work has not suffered since the inside surface is the one that would be in contact with the drinking water.

Soft water seems to cause a "green water" condition more often than hard water, probably because hard water soon coats any plumbing with some insoluble mineral salt and protects the pipes. It has been the experience of this firm that soft water is particularly troublesome if it has a large carbon dioxide content.

This cold tin plating process has also proven to be a very economical operation for them, since many of their water tubes are made from short pieces left over from tube used to carry refrigerant. Tubing used for refrigerant should not be tinned, and if they did not have their own tinning tanks, they would have to dispose of the odd pieces and buy tinned tubing to replace it.

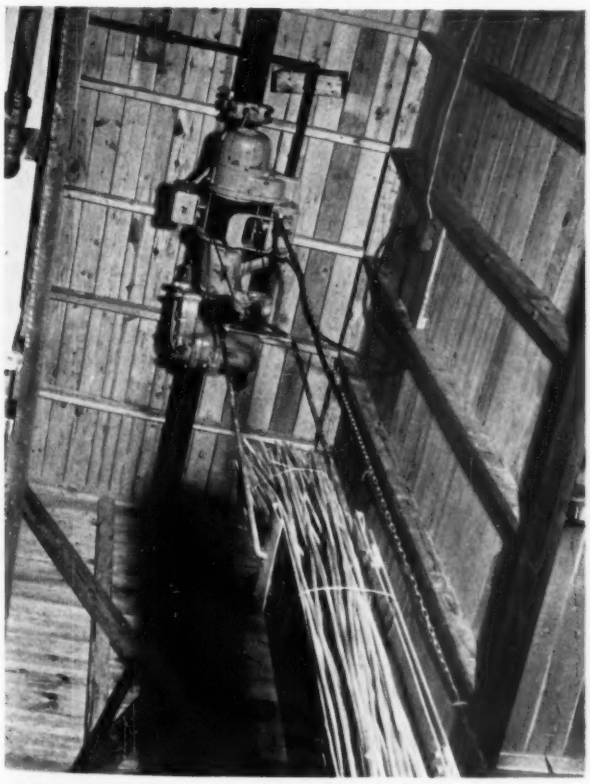


Figure 3. Looking up at the overhead electric hoist used for raising and lowering the loads of tubing during processing.

Figure 4. Unloading a batch of small drain fittings from the processing basket after immersion tinning. There are approximately 500 fittings in this batch.

The entire process takes about one hour, and 300 pieces of ⅜" tubing, 9½" feet in length, can be plated at one time. The alkaline tinning solution contains Sodium Cyanide, Stannous Chloride, and Sodium Hydroxide. This solution is prepared the preceding evening, and then mixed with water the next day. The tinning tank is drained once each week and refilled with a fresh solution.

Ebco's experience with this method of plating has borne out the findings of Sullivan and Pavlish that the tin not only added resistance to corrosion, but also gave a coating conducive to better soldering.

Also, as the developers proved, an outstanding feature of the process is that coating is effected readily by immersion in a cold bath.

In general, the chemistry of the process is merely the stoichiometric replacement of tin in the bath by copper dissolving in the solution. Naturally, when the copper becomes coated completely, the action stops and no additional coating is built up. This necessarily results in a relatively thin coating which nevertheless is complete and gives a good degree of protection.

Since this cold tin plating process was installed, they have had no complaints or rejects, and they naturally feel that the process is very satisfactory.

Reference

Tinning Copper and Brass by Immersion, *John D. Sullivan and A. E. Pavlish*, Metals and Alloys, May 1940.

Synthetic Surface-Active Agents in Metal Finishing

By Georgia Leffingwell, Ph.D., *New York, N. Y.*

OF THE numerous metal finishing assistants, the new surface-active synthetics hold a unique position, as they are among the most recent and at the same time among the most valued from the standpoint of their effective usage in an ever-broadening variety of applications and processing operations. Today these versatile products of scientific research point the way to further progress in metal finishing in efficiency of operation and improved production.

The advantageous use of these synthetic products in electroplating, wire pickling baths, corrosion prevention and rust inhibitors, cutting and grinding oils, and metal cleaners, are among the cases in point.

In less than a decade the synthetic surface active agents have shown a phenomenal rise in production and utilization in various fields of industry in general, and in the metal field in particular. It was only about 1930 that German research chemists successfully synthetized the first of the newer surface-active agents from non-fatty sources, working with the sodium salts of the higher alcohol sulfates.

From this beginning the market for the so-called synthetic detergents grew to a yearly production shortly before the war of approximately 65,000,000 pounds. At the present time synthetic detergents are reported to be produced at the rate of 600,000,000 pounds per year. It is to be anticipated that the demand for these synthetic chemical compounds will continue to increase, as research programs and practical experimental work develop new and better products and determine further advantageous applications.

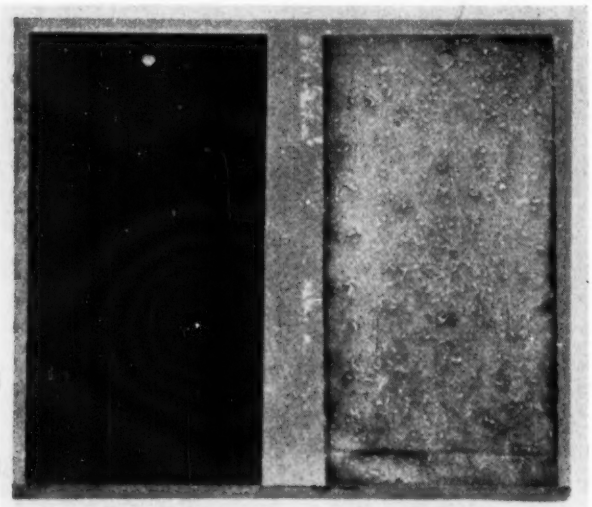


Figure 1—Illustrating the use of fluorescent compounds and ultra-violet light to measure cleaning efficiency. Dark panel on left is a chemically clean specimen. Right panel has been dipped in oil containing a fluorescent compound and both photographed under ultra-violet light.

Currently there are several hundred synthetic detergents on the market, representing some twenty different chemical types. *McCutcheon*, in a comprehensive review of synthetic detergents (*Chemical Industries, November* 1947), lists approximately five hundred trade name products, noting in each case the name of the manufacturer, the class, and the principal uses, supplemented by indicative remarks as a helpful basis for decision on specific application.

Of these numerous synthetic chemical products, the most common may be grouped in three major categories as: (1) sulfated fatty acids; (2) fatty acid amides; (3) alkyl aryl sulfonates. Processed from fats and oils or derived from petroleum by-products, these products, because of the materials used in their formulation, are generally known as sulfated or sulfonated fatty alcohols, or as petroleum derivatives.

A primary question for the metal finisher is obviously the choice of the particular synthetic product which will best satisfy his particular needs. There is some popular misconception that the synthetics are more or less similar, but actually the properties of the various synthetic surface-active agents vary widely, and each must therefore be considered in application to its specific usage. In fact, one of the most interesting points in connection with these products and one which has contributed largely to their increasing industrial use, is the extensive variations possible in formulating them.

In the main the properties of a specific product must be considered by the processor in the light of its stability to acids and alkalis, its resistance to hard water and other metallic ions, its solubility in various media, and so on. Stability to heat is also an important factor.

In understanding the variation of properties from one product to another, a brief review of the chemical picture may be helpful as a preliminary to the discussion of applications in relation to metal finishing processes.

While all these products have a very complex molecular structure, this structure may be simply

explained as consisting of two essential parts. One portion, technically termed "hydrophilic" or "water-loving," possesses polar, or water-soluble properties. The other portion, technically termed "hydrophobic" or "water-hating," has a tendency to attach itself to, or dissolve in, oils, fats, waxes, and non-polar materials (not water soluble).

The varying characteristics of the different products are governed by the balance or ratio between these two groups. Numerous types of wetting agents, emulsifiers, detergents, and penetrants, have been produced by formulating molecular structures selected to give certain desired characteristics.

If the hydrophilic (water-loving) portion of the structure is greater, for example, a wetting agent is obtained; if the two groups are in balance, a detergent; if the hydrophobic (water-hating) portion is greater than the hydrophilic portion, emulsifying agents, softeners, and dispersing agents result. Solubility may be increased by increasing the chain length of the non-polar portion, and the nature of the hydrophilic group may also be varied to produce various compounds with differing properties.

The wide range of synthetic surface active agents may be broadly classified as anionic, cationic, and non-ionic. A given product is anionic or anion-active, when the main or active part of the molecule is contained in the anion or negative portion. The anionic surface-active agents, which include the sulfonated fatty acid esters, fatty alcohol sulfates, aryl alkyl sulfonates, sulfosuccinic acid esters, and similar compounds, all have powerful wetting properties, are resistant to hard water, and in general have good detergency. Applications of various products in this group to metal finishing will be discussed later in this article.

The cation-active or cationic group of products are recent developments which may be considered the reverse of the anionic type, with the positive portion containing the major portion of the molecule. Usually they have a long-chain oil-soluble cation and consequently are incompatible or precipitated in the presence of many of the anionic synthetics.

The third group consists of the non-ionic compounds. These products are a relatively new group which have been growing in popularity. This group are excellent emulsifiers and rapidly remove oil, waxes, etc., so that by adding these agents directly to lubricating oils such oils can readily be washed off.

Modern electroplating processes find the new synthetic products of especial interest, with a number of sulfates and sulfonates playing an established role. Among them may be mentioned as indicative, an alkyl aromatic sodium sulfonate, a sodium alkyl sulfate, and an octyl alcohol sulfate. Also meriting attention for its value in metal processing is a sodium salt of alkylated aryl polyether sulfonate.

While the properties of these various useful metal-finishing assistants naturally vary according to the specific product, as previously pointed out, it is reported, for example, of the use of a certain sodium alkyl sulfate that:

"As a spreading agent it . . . improves the wetting and etching properties of acid solutons on metals and alloys, as well as reduces the pitting in nickel-plating operations."

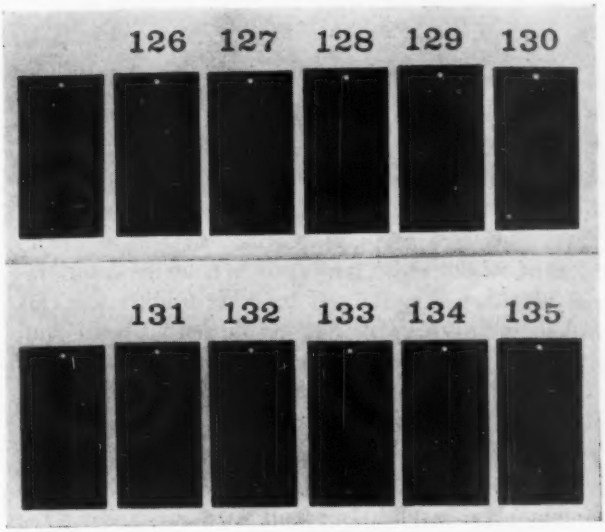


Figure II—Cleaning tests, using fluorescent "soils," indicate the increased efficiency of alkaline cleaners using synthetic wetting agents. Top group of panels were cleaned in sodium orthosilicate at concentrations of 2, 4, 6, 8, and 10 per cent; bottom group in a mixture of 95% orthosilicate and 5% of a commercial surface-active agent at the same concentrations. Absence of light areas indicates complete soil removal.

Of interest, too, are experiments made with a number of addition agents in stereotype electroplating, which indicated that smooth, semi-bright deposits could be obtained at the higher pH values by the use of a sodium lauryl sulfate.

Generally speaking, the chief function of the synthetic additive in electroplating processes and in wire pickling baths is to lower the surface tension, or more correctly, the "inter-facial tension," so that absolute contact can be made between the metal and the electrolyte, an acid-resistant compound being usually called for.

The synthetic added to acid pickle solutions acts as an inhibitor to retard the attack of the acid on the clean metal areas, making for more economical production costs through the reduction in metal loss and amount of acid required. This saving is said to justify the actual cost of the synthetic, as well as the slightly increased pickling time which may be required. A further reported advantage in the use of the synthetic is a decrease in hydrogen embrittlement.

Corrosion prevention and rust inhibitors are another important aspect of the metal finishing field in which the new synthetic compounds are playing a beneficial role. Relative to the control of corrosion of metals, new amine and soda salts of oxygenated hydrocarbons are now being used in the process of fabricating metals and serve as metal cutting and grinding lubricants as well as rust preventives. Mixtures of esters and other oxygenated hydrocarbons are being used successfully in the preparation of preservative lubricants for the operation of automobiles, and these lubricants act to prevent the rusting of internal areas during idle periods.

Tests with a series of substituted oxazoline amine-

type compounds have revealed them as valued non-volatile cationic surface-active agents with "acid-accepting" properties which can be helpfully utilized in preventing corrosion.

The action of these compounds is explained by the fact that most of the salts of the series are oil soluble, at least to a limited extent, and the product can therefore be used in small proportions in oils to tie up traces of acidity which may develop from the deterioration of either the oil itself or other additives. This acid-accepting property, it is further pointed out, makes for usefulness in corrosion preventive oils where the product will neutralize acids originated in perspiration deposited during the handling of the metal objects coated with the oil.

Both these cationic surface-active agents and an anionic alkyl naphthalene sulfonate are among the new synthetics which find advantageous use in metal cleaners. Certain of the sodium alkyl sulfates, noted above in the discussion of electroplating, for instance, are also recognized as useful in metal cleaning as well, being reported to increase the efficiency of compounds designed for such usage, with the advantage that on metal surfaces which ordinarily resist wetting, extremely dilute solutions spread in a thin continuous film.

Metal cleaning tests with a certain alkyl aromatic sodium sulfonate established the very definite boosting action on the cleaning ability of the alkalis ordinarily employed for the removal of processing oils from metals, a mixture of 95 parts alkali and five parts of the synthetic showing a distinct advantage over the use of the alkali alone.

In this connection, the factors involved in a cleansing operation may pertinently be noted. With cleansing as such simply defined as essentially "the process of removing soil," the factors which influence the process are wetting, emulsification, and dispersion. Wetting alone is insufficient. After the soil has been penetrated and loosened by the wetting action, emulsification or dispersion is necessary to complete the cleansing.

Where a greasy or oily surface is to be cleaned, emulsification is essential. This involves breaking up the oil or grease into minute droplets and removing them from the wetted surface so that they will float in the water. This acts to prevent the substances from re-forming and coalescing on the cleaned surface, and the soil can then be easily rinsed away. Where the soil is a solid particle, dispersion action distributes it, like the grease droplets, throughout the water, to be rinsed away. Rinsing is then necessary after the soil, of whatever nature, has been loosened and scattered, and practical experiment indicates further that where synthetics are used, rinsing is facilitated.

For metal cutting and grinding oils, certain sodium petroleum sulfonates, because of their characteristic properties, warrant attention.

Sodium salts of "mahogany" acids (so called because of their reddish brown color), the compounds in this group are known as "mahogany" sulfonates. These compounds are monobasic and have an alkyl aryl organic radical. Their average empirical formula is $C_xH_{2x-10}SO_3Na$. Products of this group are offered in various dilutions with mineral oil and water to suit many specialized requirements. Alkalinity is maintained within close limits, sufficient to insure maximum stability but not high enough to interfere with the effectiveness of the sulfonate and not injurious to the skin of workers.

These sulfonates have a wide range of compatibility, with good tolerance for salts of the alkaline earths and other metals, so they can be used for the preparation of soluble oils emulsifiable in hard water. They are soluble in most organic solvents and either soluble or dispersible in water, depending upon molecular weight.

Space precludes any attempt in this article to enumerate all the synthetic compounds of actual or potential usefulness in the various operations of metal finishing, or to detail methods of utilization. This review is intended merely to indicate the advantageous possibilities inherent in these relatively new industrial chemicals, which are of especial interest to the metal finisher.

To evaluate the properties of the individual products, the research programs of the large manufacturers of these synthetic compounds employ a variety of tests, and are usually helpful in recommending proper procedures for most efficient practical usage of a specific compound.

For the individual metal finisher to determine exactly which of the numerous available synthetics will give the most satisfactory results in application to his own procedures, practical experiment may well be recommended to supplement basic information supplied by the manufacturers. Using such factual information as a guide, a selection of possible products can be intelligently made, thus narrowing the field of further "first-hand" working study of results in his own finishing.

For obvious reasons, such practical test work should in every case be carried on as far as possible under existing plant conditions of processing procedure and production requirements, in order that the finisher may obtain a sound index of efficiency of action and production cost.

That new compounds will be developed as extensively in the future as they have been during the past few years is not anticipated by research chemists who have devoted intensive study to the synthetic surface-active agents. Rather it is predicted that the major development of these synthetic compounds will be in the extension of their already established industrial usage. The probability is clear that this advance in employment of synthetic surface-active agents will contribute to further progress in the metal finishing of tomorrow.

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Free Cyanide Control in Cadmium Baths

Question: Lately we seem to have considerable trouble maintaining our free cyanide high enough in our cadmium plating solution. We have never had this difficulty before and wonder if you can tell us what may be happening?

F. T. L.

Answer: One of the most common causes for this type of difficulty lies in the dragging into your cadmium tank of acidic materials from the previous acid dips. I suggest you check the rinsing steps just prior to placing the parts in the cadmium solution by catching a little of the drippings from the parts and testing with litmus paper. The shape of certain parts often prevents proper rinsing by having pockets and recesses that hold the solutions, and often special racking methods are necessary to overcome this problem. Placing a weak cyanide dip operation just before the cadmium plating will help to control the free cyanide in your case, but the problem of thorough rinsing should be first straightened out.

Anti-Tarnish Treatment for Silverware

Question: It has been brought to our attention that there has been developed a treatment for silver plated ware that will prevent its tarnishing. We believe that the treatment is given the parts during the color-buffing operation. Can you give us any further information on this?

J. J. E.

Answer: A number of treatments have been tried in the past for the prevention of tarnish on silver plated items, but none has proven entirely successful. Among these are acidified dichromate dips, evaporated oxide films, and various organic coatings. All have the disadvantage of being easily rubbed off, destroying their protective qualities. However, they are sometimes useful in maintaining showcase items in attractive condition. The evaporated films of transparent oxides have been applied to optical mirrors that are not to be handled. Several coats of good clear metal lacquer are effective in tarnish prevention of trophies and similar items, but of course their action stops as soon as the lacquer film is broken through. Flash coatings of rhodium have also been used, rhodium being more resistant to discoloration and tarnishing than the silver, but in this case the final color of the surface is that of the rhodium and not silver.

Removing Lead Oxide From Engine Exhaust Stacks

Question: We are interested in removing what we think is lead oxide from the exhaust stacks of aircraft engines. The stacks are made of stainless steel, and at present we are blasting this deposit off. Can you suggest a better way to do this?

H. J. K.

Answer: If the deposits are lead oxide, they can be removed by first degreasing thoroughly, then immersing in a strong solution of nitric acid, which will dissolve the lead oxide and at the same time passivate the stainless steel stacks. After this treatment the parts should be thoroughly rinsed free of acid in hot water.

Stripping Chrome From Plating Racks

Question: What do you recommend for stripping the chrome build-up from our plating racks? We have coated racks that go through the complete copper-nickel-chrome cycle, and we want to prevent contamination of the other baths with chrome.

R. M. D.

Answer: Chromium may be stripped from the racks by reverse current treatment in caustic solutions, which will also neutralize any chromic acid. If rack coatings are broken through or cracked they should be repaired immediately so that chromic acid cannot seep underneath the coating. Stripping the racks should be done after every few cycles so as to keep the stripping time short.

Bright Silver Plating

Question: When silver plating is to be subsequently electropolished is it necessary to continue to use carbon disulfied brightener in the plating bath?

E. B.

Answer: Even though you are going to electropolish the silver deposit, it is still desirable to obtain as much of the final brightness as possible directly from the plating operation, as this cuts down on the overall time required in the electropolishing tank to obtain a satisfactory finish. In a good many cases proper operation of the silver bath with the carbon disulfide will result in a sufficiently bright plate as to require no further operations.

Cleaning Cast Iron

Question: What method do you recommend for the cleaning of the bores of cast iron parts where graphited cores have been used to obtain smooth

surfaces? We have tried degreasing and electrolytic cleaning, but without good results.

W. J. B.

Answer: The best way to clean burned-in graphite from cast iron surfaces is by abrasive blasting methods, as it usually is necessary to remove some surface metal that is holding the graphite particles. The newer liquid abrasive blast cleaning methods should be applicable to your problem, and the names of firms who can supply equipment and further technical advice, as well as process sample parts for your inspection, are being forwarded.

Safe Use of Cyanide Cleaners

Question: We have the problem of removing corrosive residues from metal parts that have been soldered. About the only material that seems to do a satisfactory job is a cyanide solution, but this material has been prohibited due to its toxic nature. Can you suggest any other material that might work on this cleaning job?

W. S. G.

Answer: Why cyanide solutions should be "prohibited" is hard to understand, as this material is used in large quantities in many plating and finishing shops all over the country. Ordinary precautions in handling this toxic material have resulted in an excellent safety record throughout the industry, and adequate training of your personnel in its safe handling will enable you to use the material to advantage.

Heavy Tin Plating

Question: Why is it that we cannot use peroxide for an oxidant in plating tin from an alkaline stannate bath when we plate heavy deposits of .0025"? We have tried numerous times and have always ended up with bad deposits, therefore we use only sodium perborate. Can you throw any light on this problem?

W. C. H.

Answer: Your problem has been referred to several experts on tin plating, none of whom could offer any explanation of the cause of this trouble. Perhaps what is happening is that in your desire to deposit heavy coatings as rapidly as possible you are using very high current densities and high bath temperatures, which would have a tendency to break down the peroxide more readily than perborate. A check of the peroxide content at the start and again at the finish of a plating period would determine this. If this is so, the peroxide could be added at regular intervals throughout the plating cycle to keep it up to the proper concentration.

Perhaps other readers of *Metal Finishing* may have experienced this same difficulty and could offer a satisfactory explanation.

Chrome Plating Over Brazed Areas

Question: We have to chrome plate parts that have been silver soldered, and would like to know what treatments are necessary to prevent the brazed areas from showing through the final plating?

S. H. K.

Answer: If the joints are on a surface that can be covered adequately with chrome plating there should be no difficulty in covering them over with plated metal, provided a heavy enough coating is put on. Usually, however, brazed joints are so located that the chrome may not throw sufficiently to cover them up, in which case an undercoat of nickel is recommended. Auxiliary anodes can also be used to insure adequate plate reaching any recessed or shielded areas of the parts, but this usually slows down the plating process and contributes to high finishing costs.

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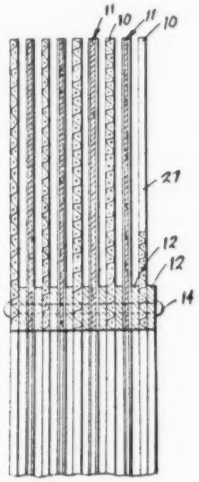
PATENTS

Buffing Wheel

U. S. Patent 2,455,680. *Nathan Kaplan.*

The combination in a buffing wheel having means for holding annular sec-



tions in spaced positions, of annular felt sections spaced from each other, and cork sections having cloth facings between said felt sections.

Anodizing Magnesium Alloys

U. S. Patent 2,456,931. *Herbert K. DeLong, assignor to Dow Chem. Co.*

In a method of producing an anodic coating upon an article of a magnesium-base alloy wherein the article is subjected to electrolysis at a current density between 1 and 100 amperes per square foot and a potential not exceeding about 10 volts in a solution consisting of water, an alkali metal hydroxide in a concentration of at least 30 grams per liter of solution, and a water-soluble aliphatic hydroxyl compound selected from the group consisting of methanol, ethanol, ethylene glycol, proplyene glycol, glycerol, mannitol, diethylene glycol in a concentration between 50 and 500 milliliters per liter of solution, said solution being maintained at a temperature between 60° and 100° C., the steps which consist in soaking the article in the solution both before and after the electrolysis for a period of about 2 to 10 minutes, the article remaining immersed in the solution from the beginning to the end of the method.

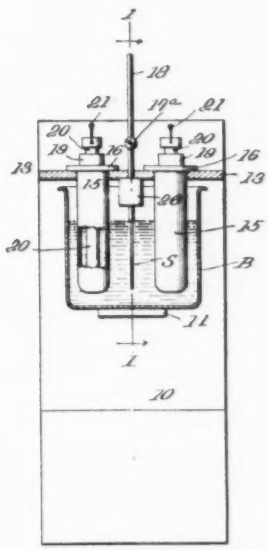
Activating Metals for Phosphate Treatments

U. S. Patent 2,456,947. *George W. Jernstedt, assignor to Westinghouse Elec. Corp.*

A stable aqueous solution for activating the surface of a metal selected from the group consisting of ferrous, zinc, cadmium metals and alloys in which they form the predominant constituent, for subsequent reaction with phosphate coating solutions consisting essentially of, in combination, at least 0.01% by weight of disodium phosphate combined with at least one water-soluble compound of a metal selected from the group of metals consisting of titanium, zirconium, tin and arsenic, at least 0.01% of a soap of a fatty acid and an amine and the balance being water.

Measuring Thickness of Tin Plating by Electrolytic Stripping

U. S. Patent 2,455,726. *Gordon H. Bendix, assessor to Continental Can Co., Inc.*



The method of determining the amount of tin present in tin plate having a ferrous base, which comprises magnetically suspending a specimen of the tin plate by its edge in an anolyte containing a standard quantity of elemental iodine in the presence of hydrochloric acid, passing electric current with said specimen as anode and employing a separate catholyte for preventing contact of the cathode hydrogen with the electrolyte, and determining the amount of iodine consumed during the stripping as the direct indication of the amount of tin originally present on the tin plate.

Tin Plating Bath

U. S. Patent 2,457,152. *Raymond A. Hoffman, assignor to E. I. DuPont de Nemours & Co.*

In a process for the electrodeposition of tin the step comprising effecting electrodeposition from an aqueous, tin-plating bath which contains a soluble tin compound, the process comprising effecting electrodeposition in the presence of 0.001 to 25 grams per liter of a bath soluble polyalkylene oxide of molecular weight over 400 as an addition agent.

Electrolytic Polishing of Stainless Steel

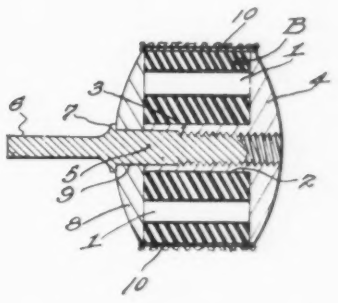
U. S. Patent 23,069 (*Re-issue*). *Alexander L. Field, assignor to Armco Steel Corp.*

The art of electro-polishing a stainless steel product which comprises, immersing the product to be polished in a bath containing by volume 80% or more of concentrated aqueous nitric acid (sp. gr. 1.40-1.42) and the remainder being water, and while maintaining the bath at a temperature below 25° C., passing only alternating current through said bath between the product and a cooperating electrode immersed therein, the current density being at least ½ amperes per square inch of product surface.

Drum Sander

U. S. Patent 2,458,217. *Francis H. Staggs.*

A drum sander comprising an elastic cylindrical body having an axial bore therethrough, end plates, one of said end plates having an axial tubular stem extending through the bore of the



body, the second plate having an axial opening, a mandrel extending through the opening of the second plate and extending through and threadably secured in the bore of the stem, said mandrel having a flange for contact with the outer face of the second end

plate, and a continuous sander band snugly fitted around the body.

Production of Tin Fluoborate

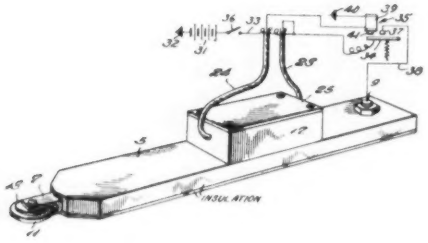
U. S. Patent 2,457,798. *Alfred L. Ferguson, assignor to Federal-Mogul Corp.*

The method of producing tin fluoborate, which comprises mixing fluoboric acid and cupric oxide, heating the resulting mixture to dissolve the cupric oxide and form a solution of copper fluoborate, adding to the said solution metallic tin to react with the solution and produce tin fluoborate and precipitating metallic copper from the solution.

Electroplating Apparatus

U. S. Patent 2,457,510. *Delbert G. Van Ornum.*

An electroplating device comprising a housing of non-conductive material



and adapted to be moved in a fixed path over a piece of work to be electroplated, an electrode projecting out of said housing to travel therewith with one end in close proximity to the work, said electrode being slidably mounted in said housing for retraction therein, work-engaging means of insultation material secured to and extending beyond said electrode for causing retraction of the electrode into said housing as the thickness of the electroplating on the work increases, a switch carried by said housing for controlling an electric circuit in which the electrode is interposed, and means for opening said switch operative by retraction of said electrode in a predetermined degree.

Electrolytic Polishing of Stainless Steel

U. S. Patent 23,068 (*Re-issue*). *Alexander L. Field, assignor to Armco Steel Corp.*

In the polishing of a stainless steel product, the art which comprises, immersing the product to be polished in a bath containing by volume 80% to 40% of concentrated nitric acid and the remainder concentrated acetic acid, and while maintaining the bath at a temperature below 25° C. passing only alternating current through said bath between the product and a cooperating electrode immersed therein, the current density being at least ½ amperes per square inch of product surface.

Blackening Copper Alloys

U. S. Patent 2,457,480. *Earle B. Lewis.*

The process of producing a black surface on a copper base alloy, the process comprising immersing the alloy in an aqueous solution which is approximately at the boiling temperature and which consists essentially of an alkali selected from the group comprising sodium hydroxide and potassium hydroxide and of an oxidizing agent selected from the group comprising sodium bromate and potassium bromate, the concentration of the solution ranging from 10 g./l. hydroxide and 15 g./l. bromate to 800 g./l. hydroxide and 400 g./l. bromate, continuing the immersion until the surface color of the alloy is uniformly changed to a brownish color in the range from grey-brown to purple-brown, and thereafter immersing the alloy in a second hot aqueous solution consisting essentially of an alkali selected from the group comprising sodium hydroxide and potassium hydroxide and of a chlorite selected from the group comprising sodium chlorite and potassium chlorite.

Conversion Coating for Magnesium Alloys

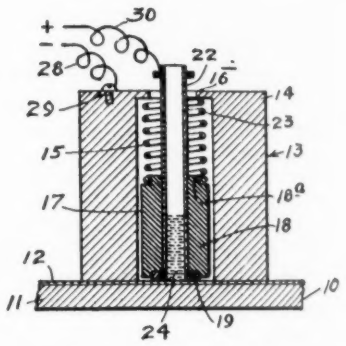
U. S. Patent 2,458,073. *Herman W. Hemker and Donald I. Eppink, assignors to Parker Appliance Co.*

The method of providing a corrosion-resistant coating upon surfaces of magnesium and high-magnesium-content alloys, which comprises contacting the surface at a temperature of 120 to 170 degrees C. for substantially 15 to 60 minutes with an aqueous solution prepared by dissolving in water, as the predominant constituents, 62.5 to 187.5 parts of alkali metal hydroxide, substantially 24 to 72 parts of alkali metal bichromate, and substantially 20 to 60 parts of alkali metal nitrate, the proportion of water in the solution being between 20 and 55 per cent, and the solution having a pH value in excess of 13.

Electrolytic Thickness Tester for Plated Metals

U. S. Patent 2,457,234. *William S. Herbert & Howard T. Francis, assignors to Armour Research Foundation of Illinois Institute of Technology.*

Apparatus for use in determining the thickness of a metal coating over a dissimilar foundation metal, comprising an open-ended hollow metal member for direct gravity contact with the coating to be measured, said member having an upper inturned annular shoulder, annular insulating and sealing means movable within said member for resting against said coating to define a predetermined area thereof, resilient means between said shoulder and said annular insulating and sealing means transmitting a part only of the



weight of said metal member to urge said insulating and sealing means against said coating, a hollow electrode extending into said metal member and fitted into said annular insulating and sealing means to form the side walls of a receptacle for an electrolyte, and external electrical connections to said electrode as the cathode and said metal member as the anode to complete an electrical circuit including said electrode metal member and said electrolyte to effect an anodic dissolution of metal from said coating over said predetermined area.

Indium Plating

U. S. Patent 2,458,839. *John R. Dyer, Jr. and Timothy J. Rowan, assignors to The Indium Corp. of America.*

An electroplating bath containing as essential electroplating ingredients the anion SO_3NH_2 and the cation In in an ionizing solvent, the pH of said bath being below about 3.5, and the concentration of indium being at least 20 grams per liter and the concentration of sulfamate radical being at least 167 grams per liter.

Engineering Information Useful In Designating Metallic Surface Treatments

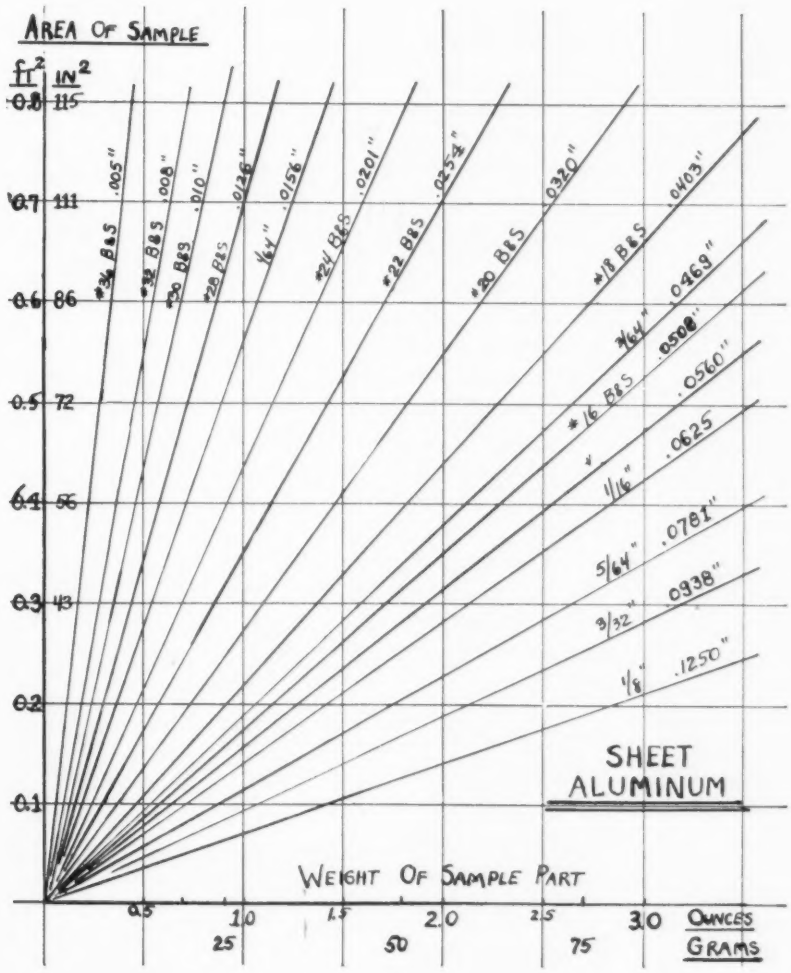
Engineering Data Sheet

Determining Areas of Sheet Metal Parts

3 — ALUMINUM STAMPINGS

The following chart may be used for estimating with sufficient practical accuracy the total plating area of parts made from flat sheet aluminum. This chart does not take into account the considerable amount of edge area that may be present on the heaviest parts made of thick stock, which can be easily measured and added to the figures found on this chart, nor the areas to be subtracted for holes. All that is required is the weight per piece and thickness of the stock used.

For parts heavier than those included in the chart, the area can be estimated by figuring first the area of a part one-half or one-quarter the weight of the sample part, then multiplying by the appropriate factor of two or four as required.



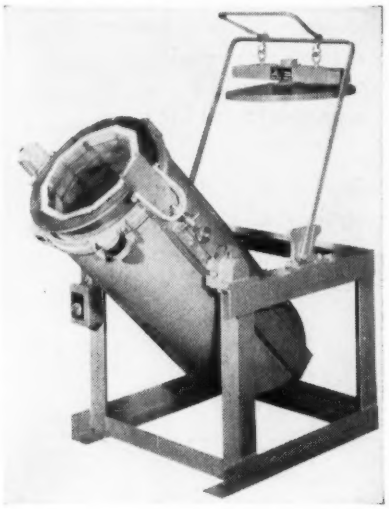
Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Improved Burnishing Barrels

Hanson-Van Winkle-Munning Company, Dept. MF, Matawan, N. J.

The above firm announces the development of redesigned burnishing barrels of the Mercil type, embodying a



number of important improvements, as follows:

1—Both the No. 1 and the No. 2 Mercil burnishing barrel units are now being supplied with a reducer type direct-connected drive with motor, thus eliminating spur gears. This means quieter and more efficient operation, according to the firm.

2—Three roller bearings in a supporting ring have been placed under the barrel at the forward end, which helps alignment and in addition, serves to distribute the weight of the load over the entire barrel.

3—The internal gear is fastened to the bottom of the barrel from the outside, thereby elminating the necessity of removing the wood lining blocks when gear or shaft change is necessary.

4—The metal flange at the top of the barrel has been increased from ¾" to approximately 2", and the thickness increased from 3/16" to ½". This strengthens the cover and prevents leaking.

5—The base casting is larger and the main shaft has been increased in size, forming a stronger unit.

6—The cover gasket is seated on the steel flange instead of on wooden blocks. This provides a better seal between the barrel and the cover.

7—The BX conduit between the switch box and the motor has been replaced with neoprene rubber covered cable, an important safety feature.

8—Totally enclosed ball bearing type motors are now used instead of open type sleeve bearing motors.

9—Burnishing barrel equipment with vulcanized rubber lining can now also be furnished.

Chemical Stripper for Nickel and Other Metal Coatings

Enthone, Inc., 442 Elm Street, Dept. MF, New Haven, Conn.

The above firm has announced the development of a material called "Enthone Metal Stripper" for chemically dissolving nickel and other metal coatings from steel without attacking the steel. The stripper is alkaline in nature, can be contained in a steel tank and requires no electric current. The parts to be stripped are merely immersed in a solution of Enthone Metal Stripper salts, in the temperature range from 160-180°F. Stripping speed varies from .0002" to over .001" per hour depending upon the concentration of salts and the operating temperature, it is said.

The process is stated to be ideal for removing of nickel plate from bulk work, such as barrel nickel plated steel, which hithertofore has been impossible or difficult to strip without attacking the base metal. The process does not etch or attack the base steel in any way, according to the firm.

The stripper is also effective for removing copper plate from steel as well as silver, cadmium and zinc, but is not suitable for removing nickel coatings from zinc base die castings or copper alloys.

Enthone Metal Stripper comes under U. S. Patent No. 2,460,896 and further patents are pending.

Synthetic Cleaner

Quaker Chemical Products Corp., Dept. MF, Conshohocken, Pa.

Quaker Formula 100, synergized synthetic cleaner developed and sold by the above firm is replacing vapor degreasing, solvent cleaning, solvent emulsion cleaning, and electrolytic cleaning for the removal of mineral oil type soils in certain applications, it is claimed.

This powder-type product is used at concentrations of 2 to 3 ounces per gallon with water as a tank type cleaner in the temperature range of 130°F. to boiling, and will prepare metal surfaces for bonderizing, electroplating, painting, and other critical operations with immersion times of less than 2 minutes in the cleaning cycle, according to this firm.

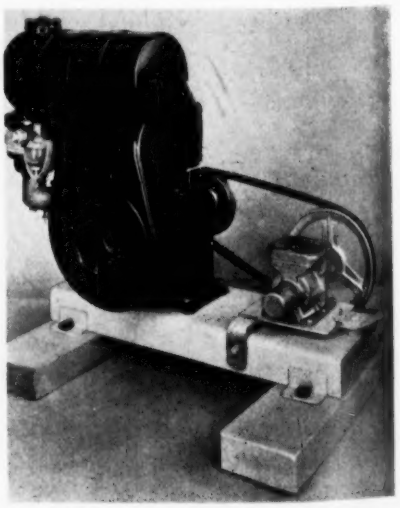
Quaker Formula 100 can be applied to the cleaning of steel, brass, die casting, and aluminum. With the latter material, the extremely fine grained but superficial etch provided yields unusually good paint adhesion, it is claimed.

Portable Pump Unit

Eco Engineering Co., 12 New York Avenue, Newark 1, N. J.

A new portable pump unit has just been announced by the above firm, manufacturers of gearless pumps.

This new unit consists of an Eco



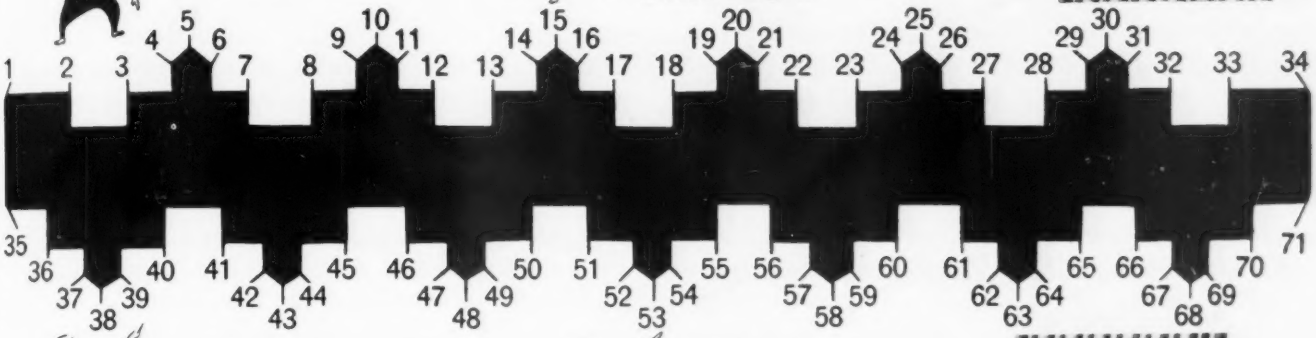
Why DIVCO 71-Point Lead Anodes Give Unequalled Plating Results

71 Throwing Edges

conduct current into the plating solution with minimum voltage drop. Count the edges on the enlarged cross-section shown below.

Patented Design

Only Divco 71-Point Anodes have the unique design shown in the enlarged cross-section — distinctly different from corrugated, sawtooth and ribbed designs.



Concentrated Surface Area

provides double the surface area of flat anodes and 50% more than corrugated, sawtooth or ribbed anodes in the same tank wall space.

Self-Scrubbing Action

produced by patented design concentrates gassing and sweeps surfaces clean, eliminating stagnation and reducing resistance.

Concentrated Surface Area and 71 Throwing Edges make the BIG DIFFERENCE

The concentrated surface area enables you to get maximum anode area close to the work for higher current density at the plating surface. Maintenance of proper solution balance through oxidation of trivalent chromium back to chromic acid is assured.

The 71 Throwing Edges aid in the transmission of heavy chrome plating currents into the solution with minimum voltage drop.

The special Divco-Developed Alloy plus self-scrubbing action maintains high efficiency with minimum cleaning and scraping.

That's why Divco 71-Point Anodes plate faster and produce a more uniform deposit. Reduce Rejects. Plate uneven, irregular and hard-to-reach surfaces more effectively. Eliminate bottlenecks and increase all around plating efficiency.

Equip a tank with Divco 71-Point Anodes and see how quickly everybody learns to take difficult jobs to that tank.

Avoid Substitutes

Look for "DIVCO" beneath the hook or count the 71 edges

In ordering, specify bus bar size and distance from top of bus bar to bottom of anode.

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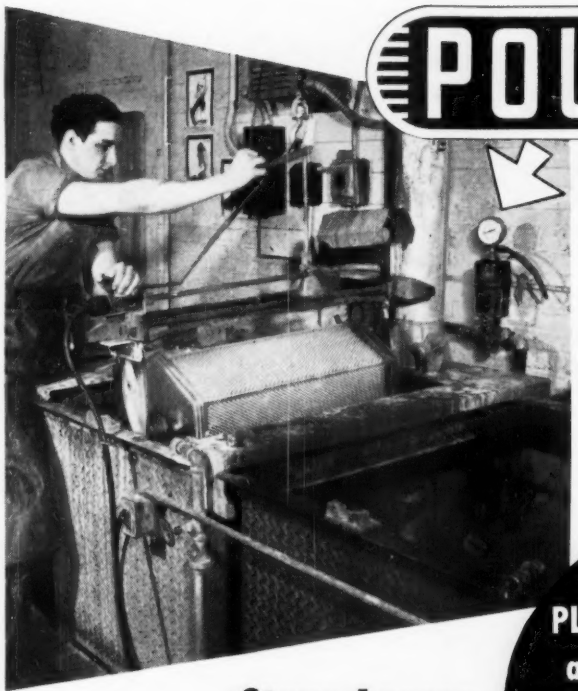
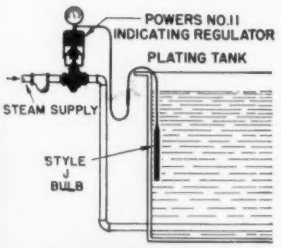


POWERS

TEMPERATURE CONTROL



In PLATING, CLEANING and RINSE TANKS METAL PARTS WASHERS DEGREASERS ANODIZING, BONDERIZING AND PICKLING TANKS

Stops Losses Caused by OVER-Heating

Stop human errors, mechanize temperature control of plating operations with POWERS No. 11 INDICATING REGULATORS. They maintain a constant temperature, are self-operating and easy to install.

Easy to Read Dial Thermometer indicates temperature in tank. Thermostatic bulb is lead sheathed or made of stainless steel. Powers regulators are gradual acting and ruggedly built to give the dependable control required for good plating.

Will Help You Get a Better Product at Lower Cost Better temperature control of plating solutions will help reduce rough plating, buffing time, insure plating within the bright range and reduce decomposition of solutions. Powers regulators pay back their cost many times a year. They are—

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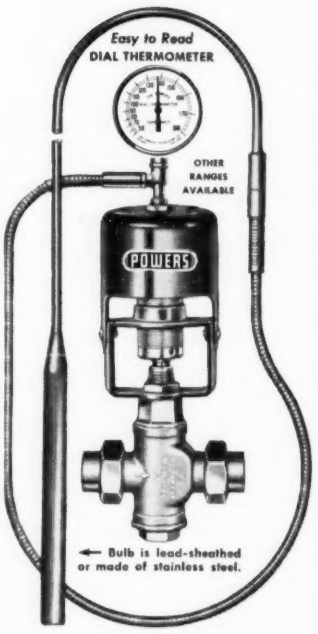
SIMPLE • ECONOMICAL • DEPENDABLE



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Over 55 Years of Temperature and Humidity Control

Gearless Pump, Model PP-2, powered by a 1½ h.p. single cylinder, four cycle air cooled gasoline engine. It is designed for use wherever a portable type emergency pump is required.

The belt can be removed by simply raising the pump, which is hinged. When the pump is not in use, the engine can also be used to run a generator, lathe, saw, drill press, sander, or any other similar motor-driven tool or equipment.

The total weight of the unit is 51 pounds. Dimensions of the unit are approximately 18″ high x 18″ long x 15″ wide.

Chemical Polish Protects Copper, Brass, Bronze

Allied Research Products, Inc., Dept. MF, Baltimore 5, *Md.*

Iridite Metcote, a chromate-type chemical polish for producing a lustrous, corrosion-resistant surface on copper, brass or bronze surfaces has been introduced by this firm.

Applicable to sheet, rod, castings or forgings, Iridite Metcote serves as a triple-purpose process: for brightening, tarnish resistance, or paint base. The coating is applied by a short, non-electrolytic dip, operated at slightly elevated temperatures.

Iridite Metcote claims three important advantages over sulfuric or nitric acid polishing solutions in that it is non-fuming and non-critical during operation, and that the work being processed is chemically polished and does not become etched, even from long immersion periods. In addition, production rates may be increased by raising the temperature of the bath. The usual plating shop equipment and operators are all that is needed to install the process in any type of plant, it is said.

Work to be processed should first be thoroughly cleaned, rinsed, and the parts handled as follows: Iridite Metcote, rinse, optional bleaching dip and rinse, hot rinse and dry.

Tests to date indicate that the coating thus produced shows marked superiority in salt spray to ordinary brightening processes.

Iridite Metcote is sold in ready-to-use form, with the addition of a small amount of hydrochloric acid.

Electrical Thermometer for Remote and Multiple Indications

Weston Electrical Instrument Corp., Dept. MF, 617 Frelinghuysen Avenue, Newark 5, N. J.

A new electrical thermometer, designed particularly for the many industrial applications where remote indications are necessary, has been announced by the above firm.

Known as the Model 918, this thermometer employs a sensing element known as a resistor bulb, which is readily placed in tanks, grain bins, machines, etc., with the direct indicating instrument mounted any reasonable distance away from the bulb. With the incorporation of a selector switch and multiple bulbs, a number of temperature measurements are possible while using but one indicating instrument.

Weston describes the Model 918 indicator as a ratio-type instrument with a scale over five inches long, having excellent control and damping, and showing quick response to temperature variations. It is designed for use on 100-130 volts, 50-60 cycles a-c, and is not affected by normal line voltage variation. It can also be supplied for use on d-c.

Complete technical information and specifications on the Model 918 can be obtained by writing to the company.

Flat-Top Copper Anodes

Wagner Brothers, Inc., Dept. MF, 418 Midland, Detroit 3, Mich.

The above firm announces the introduction to the plating field of their new Flat-Top copper anodes. Advantages claimed for this distinctly shaped anode are as follows:

Greater area than ordinary ball anodes.

Manufactured from highest purity copper.

Packed in convenient wooden kegs.

Smooth surfaces, with no gates or flash.

Convenient—no hook replacement or attachment required.

Literature describing these new anodes is available. If the request is made on your firm's letterhead a Gold plated Copper Flat-Top paperweight will also be sent as long as the supply lasts.

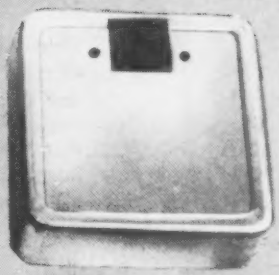
IT PAYS TO PRECLEAN with Magnusol

WHENEVER...

- you Clean after Buffing and Polishing; Drawing and Stamping; Machining and Grinding.
- you Want to Cut Down the Time of Exposure of Die Cast and Soft Metals to Alkaline Cleaners.
- you Have to Remove Sleshing and Grinding Oils.

Instrument case stamping before cleaning.

Precleaned with Magnusol (physically clean) ready for painting or for final alkaline cleaning.



Electro-cleaned (chemically clean) with Magnus 94XX after precleaning, ready for plating or vitreous enamelling.

Precleaning with Magnusol solves the problem of removing stubborn dirts (particularly solid particles) which resist the action of vapor degreasing and alkaline cleaning solutions. It gives you a physically clean surface, ready for painting, lacquering or any other finishing operation which does not require a chemically clean surface.

If you must clean with an alkaline solution to provide a chemically clean surface for plating or vitreous enamelling, precleaning insures much more satisfactory results, with virtual elimination of rejects due to improperly cleaned surfaces.

Precleaning with Magnusol is quick, easy and sure. Work is simply dipped or sprayed with a solution made up of one part of Magnusol concentrate and eight parts of kerosene or safety solvent, then drained and flushed clean with water. The Magnusol solution is harmless to *all* metals, non-toxic and non-flammable. The entire cleaning operation can be carried out at room temperature.

Write for recommendation on your cleaning operations.

MAGNUS CHEMICAL COMPANY • 11 South Ave., Garwood, N. J.
IN CANADA—MAGNUS CHEMICALS, LTD., 4040 Rue Masson, Montreal 36, Que.
Service representatives in principal cities

IN METAL CLEANING IT'S Magnus
CLEANERS • EQUIPMENT • METHODS

Spraying's Better...

For Buffing and Polishing!

Because:

1. Optimum quantity of composition always maintained on the buff—desired amount of composition is present for each piece buffed and assures proper cutting and coloring.

2. Spraying eliminates unnecessary wear—deficiency of composition causes excessive cloth wear.

3. Spraying with properly formulated compositions greatly simplifies cleaning after buffing with the proper types of cleaners.

4. From 50% to 75% less spray composition is needed for the same work as bar composition.

5. Spraying eliminates fire hazard by keeping the buff properly coated at all times—it's safe!

The Famous Siefen System is a Better Spraying System BECAUSE:

The Siefen System is designed by the finest engineers in their field. It's designed for your particular work and backed by the finest Spray Compounds on the market. Our Service is at your service—to increase your profits!

THE Siefen System
SPRAY EQUIPMENT
SPRAY COMPOUNDS
SPRAY SERVICE

J. J. SIEFEN CO.
5657 Lauderdale
Detroit 9, Mich.

Metal Cleaning Process

Northwest Chemical Co., Dept. MF, 9310 Roselawn Ave., Detroit 4, Mich.

An improved Lo-Hi process for the preparation of metals for plating and vitreous enameling is announced by the above firm. This two-tank procedure not only removes soil of all types but also activates the surface of the ware, completely conditioning it for ground coat, it is claimed. The new process, in addition to being longer lived, more economical and easily controlled, can be depended upon to dissolve light surface rust and to soften scale and welded sections, it is claimed. Due to the thorough cleaning and surface activation of this two-tank process, savings in pickling time or acid concentration, or both, may be expected, according to the firm. The cleaning cycle is five minutes in each tank with no intervening rinse.

Hand Cleaners

Diversey Corp., Dept. MF, 53 W. Jackson Blvd., Chicago 4, Ill.

Two new hand cleansers—Derma-Skour No. 1 and No. 2—have been introduced to industry by this firm.

Derma-Skour No. 1 is a general purpose cleanser. Derma-Skour No. 2 is a heavy duty cleanser for removing stubborn contamination, deeply-embedded grease and grime.

Both cleansers contain a specially-processed cereal-base scrubber, completely harmless to the hands, but unusually vigorous in its attack on dirt, it is claimed. The cleansers are equally effective over a wide range of water temperatures and hardness.

A special chromium-plated steel dispenser is also available, which makes for greater convenience and economy of use. Positive cut-off control prevents waste. Carton has easy-pouring feature for filling dispenser. Cleanser is free-flowing—never cakes.

Wood Plating Barrels

King's Hardwood Plating Barrels, Dept. MF, 48-50 Springfield St., Dayton, O.

The above firm manufactures hardwood plating barrels, for all plating solutions, in standard and special sizes. Prompt service and rapid delivery are claimed. Over 50 years experience in the wood plating barrel field have been built into their efficient and trou-

ble-free barrels, according to the firm. Complete information and prices are available on request.

Industrial Metal Cleaning Compounds

The DuBois Co., Dept. MF, Cincinnati 3, Ohio.

The above firm offers complete data on their alkaline metal cleaning compounds, Terj and Ferro-Terj. Terj is a metal cleaner designed for removing light shop soils and for use in industrial washers when cleaning aluminum. Will not pit, corrode or discolor aluminum when used in a spray washer, it is claimed. Ferro-Terj, a heavy-duty metal cleaner, is designed to remove tenacious soils such as drawing compounds from steel parts. It is the first completely solventized detergent for use on ferrous metals, according to the manufacturer.

Both Terj and Ferro-Terj are free-rinsing, and leave no deposits on finished work to interfere with subsequent painting or plating operations, it is claimed. From an economy standpoint both products are extremely inexpensive to use as they are used in low concentrations.

Dipping Baskets

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above firm announces that they are in a position to handle inquiries for special types of baskets and to offer reasonably good delivery, no matter how unusual the specifications may be. They can place at the disposal of the customer the facilities of an engineering department for the figuring of any job, whether for unusual designs or for standard baskets to fit a given production pattern. They require only the following information:

A. Work

1. Weight per piece.
2. Size and shape.
3. Anticipated hourly production in terms of pieces or plating cylinders of given size.

B. Cycle

1. The sequence of alkalies, acids, and rinses.
2. Concentration of alkalies and acids.
3. Temperature of above.
4. Immersion times in each treatment.

ELIMINATE BUFFING
REDUCE PLATING COSTS

BICYCLE PARTS
PROBLEM: To secure the quality finish desired for its products, a manufacturer of bicycle parts found a copper buffing or nickel buffing operation was required. The unusual shape of many of the parts added to the time required for these buffing operations, increased the overall cost of parts production.
SOLUTION: Converting to Daybrite—the improved acid copper bath—enabled this manufacturer to eliminate all buffing operations, cutting production time and costs. Dense, smooth deposits, and Daybrite's inherent leveling action provide the quality finish desired without resorting to buffing operations.
USING Daybrite
THE IMPROVED ACID COPPER BATH

• If your plating department is retarding the productive output of your plant, better learn now how Daybrite can step up plating production, help cut plating costs.

Daybrite offers faster plating speeds—up to .001 in just 10 minutes—smooth, dense deposits that simplify or even eliminate buffing operations, and an inherent leveling action that tends to eliminate minor defects in base metals.

To gear your plating department to modern production speeds, write, without obligation, for complete information.

✔ CHECK THESE DAYBRITE ADVANTAGES:

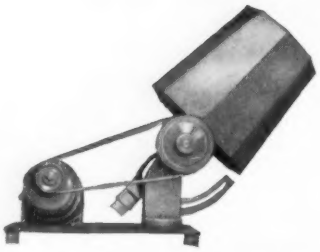
FASTER PLATING—Plating speed up to .001 in 10 minutes.
LEVELING ACTION—Tends to eliminate minor defects in base metal.
NO VENTILATION REQUIRED—No objectionable fumes or odors.
ROOM TEMPERATURE BATH—No hot solutions used with Daybrite.
REDUCED MAINTENANCE COSTS—Daybrite replacement chemicals cost less.
SAFE, CLEANER—No cyanide is used in Daybrite; deposits require no activation.
COMPLETE SERVICE—From analysis of your plating requirements to final installation and job set-up, Daybrite service is complete.

Daybrite is adaptable to electroforming operations, as proven in the recording industries, where Daybrite's inherent fine grain and tensile properties are especially beneficial.

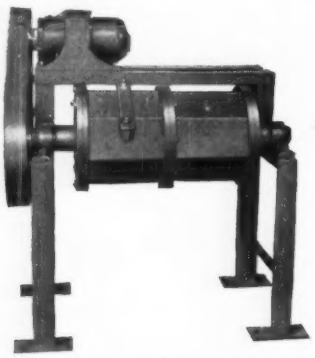
Dayton Bright Copper Company
1060 VALLEY STREET • DAYTON 4, OHIO

ON SMALL JOB LOTS

FINISHING COSTS TUMBLE



TILT-TYPE BENCH MODEL — motor or belt driven. Adjustable elevation. Steel, wood, rubber lined or alloy metal barrels.



HORIZONTAL FLOOR MODEL — light duty for bulk tumbling and burnishing of small parts.

. . . . when you use a Henderson Oblique Tilt-type Bench Model Tumbling Barrel.

Ideal for SMALL-LOT FINISHING and SAMPLE LOT PRODUCTION of jewelry, clock parts and similar products requiring a *quality finish at minimum cost.* Widely used in laboratory experimental work.

ALSO HORIZONTAL TUMBLING BARRELS — both light and heavy duty for small-lot and quantity production.

Tumbling barrels for every purpose or, made to order to meet your special requirements.

Write now for further information.

Since 1880 Designers and Builders of Tumbling Barrel Equipment.

THE HENDERSON BROS. COMPANY
135 SOUTH LEONARD ST. WATERBURY 85, CONN.

New Rotary Magnetool

Multifinish Mfg. Co., Dept. MF 438A, 2114 Monroe St., Detroit 7, Mich.

A new design of the Multilift Rotary Magnetool, used for steel pick-up purposes, gives 50 percent more magnet power and offers improved handling features, according to the manufacturers.

The rotating magnetic tube is propelled manually in carpet sweeper fashion to pick up steel scrap or parts from floors, parking lots, and driveways. The tools are water-proof and oil-proof and operate without wires or electricity. An acid-proof model adaptable for use in tanks is also manufactured.

The magnetic tube rotates with the wheels and loads automatically to a thickness of ¾" on the entire 360 degrees of surface. Unloading is accomplished by pushing the wiper ring from one end of the tube to the opposite end where a non-magnetic area causes instant release of the load. The unloading area is tapered so parts slide off readily without lodging.

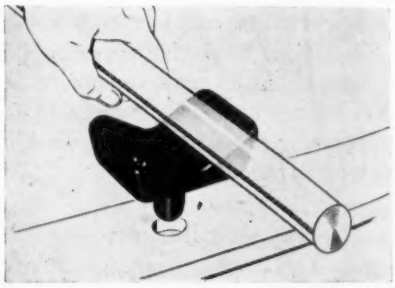
Improved design features include rigidity in the frame, and a heavier removable handle with a rubber grip.

Unbreakable Anode Rod Support

Automotive Rubber Company, Inc., Dept. MF, 8601 Epworth Blvd., Detroit 4, Mich.

A new simplified, self-aligning, unbreakable anode rod support is made of non-ferrous metal completely covered with tough semi-hard rubber.

The pin of the support sets in a hole provided in the tank flange. The support pivots to compensate for misalignment and will support excessive loads and rods up to 4".



Elimination of bolts that corrode and get lost, and time consumed installing ordinary breakable types, especially when bolt holes don't line up, represents a big savings for electroplaters.

A new bulletin, Number 250, describing the unbreakable self-aligning support is available on request.

Plastic Lining Material

The Poly-Cyclo Products Co., Dept. MF, of Cleveland, Ohio.

The above firm announces Cycloflex PC-11 Plastic Lining as a rugged, chemically-inert membrane developed specifically for the protection of drums and tanks.

Inorganic acids, alkalies, aliphatic hydrocarbons, water, oils, grease, oxidants, cleaners and even the higher oxidizing reagents such as nitric and chromic acids are readily repelled, it is claimed. Progress of work may be easily observed and parts and other

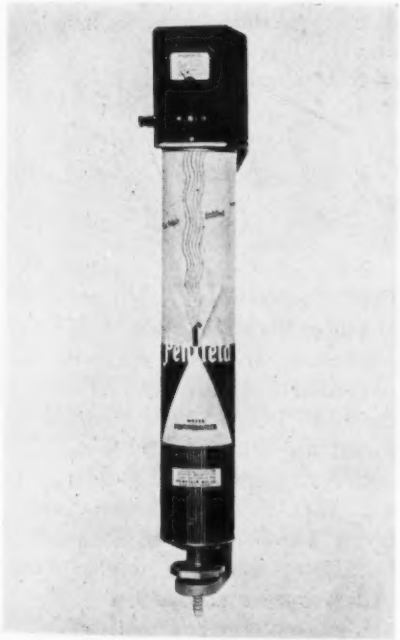
foreign matter accidentally dropped into tank or drums are easily detected with Cycloflex white inter-lining that permits solution visibility. This white lining is entirely non-contaminating to any plating solution including rhodium, gold, etc., it is said. Drums and tanks lined with Cycloflex white have a smooth high-gloss finish that makes them easy to drain and easy to clean. It is also available in high-gloss black. Both linings withstand great fluctuations in temperature and will not break, crack, chip or peel even at high temperatures, according to the firm.

Inside and outside bottoms of tanks and drums should have an extra heavy coating to assure greater protection and provide a cushion for increased safety.

Water Demineralizer

Penfield Manufacturing Co., Dept MF, 12 High School Ave., Meriden, Conn.

This firm announces a new cartridge-type water demineralizer espe-



cially designed to convert ordinary tap water to the chemical equivalent of distilled water at a very low cost.

Faucet water passes through a series of four beds of ion exchange resins. In the first, water is acidified, then it is neutralized and adsorbed. Metals removed include sodium, potassium, calcium, magnesium, iron, copper, lead, etc.; salts removed are sulphates, carbonates, chlorides, etc.

The demineralizer consists of a wall bracket, the renewable resin cartridge and an electrical resistance indicator to show when a new cartridge is needed. Unit is reasonably priced.

Repeat Cycle Timer

G. C. Wilson & Company, Dept. MF, 2 N. Passaic Ave., Chatham, N. J.

This timer is an electronic device employing one radio type vacuum tube and obtains its timing intervals by the charging of two resistance-capacitance networks. Operation is such that one cycle initiates the next cycle without any moving parts or external operation. The OFF and ON cycles are infinitely variable over the ranges specified below, and are substantially independent of one another. The timer is highly stable and only very slightly affected by changes in line voltage, temperature, etc., according to the manufacturer.

TECHNICAL DATA

Power Supply

105-120 volts, 60 cycles (DC timers also available)

Time Intervals

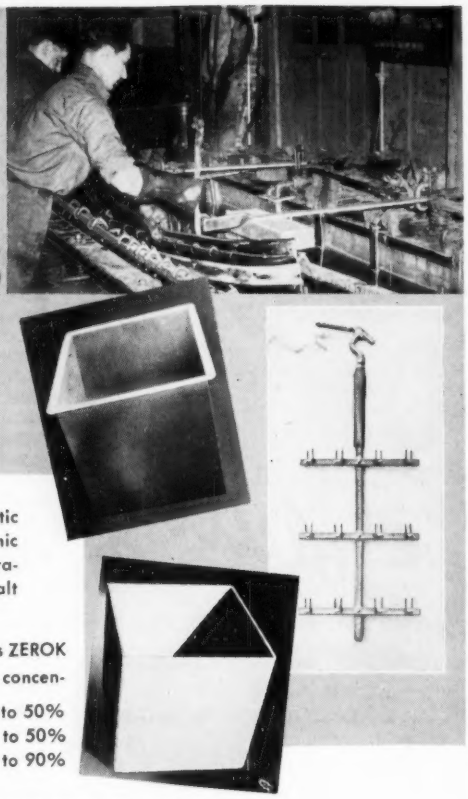
ON: 0.2 to 200 Seconds
OFF: 0.1 to 60 Seconds

Since the standard relay provides DPDT (two makes and two breaks) the intervals above, are interchangeable. Longer or shorter intervals can be provided on special order.

Relay

The relay employed is of rugged construction and highly resistant to

Corrosion-Proof LININGS and COATINGS for TANKS and RACKS used in Metal Finishing



FOR STEEL — Atlas NEOBON Synthetic Rubber — Withstands non-oxidizing inorganic acids, such as sulphuric up to 50% concentration; hydrochloric, phosphoric acids and salt solutions in any concentration.

FOR STEEL and CONCRETE—Atlas ZEROK Synthetic Resin — Withstands these acids in concentrations listed:

Nitric.....up to 50%
Chromic.....up to 50%
Sulphuric.....up to 90%

These linings are factory-applied with brush or spray, to build up to required thickness. ZEROK is used also to protect structural members of steel or concrete.

ATLAS FLOORS are proof against any specified acid, alkali or solvent. They retain their smooth surface and withstand heavy traffic and severe mechanical punishment. Units of Atlas Construction need no time out for repair, and maintenance cost is practically nil.

Atlas offers *complete service:* materials, design and, when desired, supervision of installation. Our engineers will gladly study your acid-proofing problem, make recommendations and submit plans and estimates — all without obligation. Contact our nearest branch. And write us at Mertztown for recommendations.

THE *Atlas Mineral* *Products Company of Penna.*

THE ATLAS MINERAL PRODUCTS CO. OF TEXAS INC., Box 252, Houston 1, Tex.

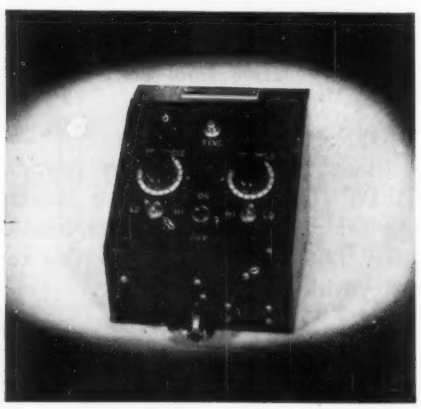
*BERKELEY 2, Calif., 605 Addison St.
DALLAS 5, Tex., 3921 Purdue St.
*DENVER 2, Colo., 1921 Blake St.
*HONOLULU 2, Hawaii, U. S. A.
OMAHA, Neb., 423 South 38th Ave.
*LOS ANGELES 12, Cal., 1725 S. Central Ave.
*SEATTLE 4, Wash., 1252 First Avenue, S.
*Stock carried at these points

MERTZTOWN PENNSYLVANIA

*ATLANTA 3, Ga., 452 Spring St., N. W.
*CHICAGO 1, Ill., 333 No. Michigan Ave.
*DETROIT 2, Mich., 2970 W. Grand Blvd.
NEW YORK 17, N. Y., 475 Fifth Ave.
PITTSBURGH 27, Pa., 4921 Plymouth Rd.
PHILADELPHIA, Pa., 355 Fairview Rd. Springfield, Pa.
ST. LOUIS 5, Mo., 7603 Forsythe Blvd.

IN CANADA: Atlas Products are manufactured by H. L. BLACHFORD, Limited, 977 Aqueduct Street, Montreal 3, P. Q., 86 Bloor St. W., Toronto, Ont.

shock and vibration. The DPDT contacts are each rated at 10 amperes 115 volts, or 2 amperes 460 volts, non-inductive. All contacts are wired to either Jones Plug (as shown in cut above) or Terminal Strip.



Housing

Steel Cabinet 6″ x 6″ x 6″ with a sloping front.

Operation

All controls are on the front panel and consist of: Off-On toggle; Fuse; Synchronizing Push Button; Off and On and Long and Short Time Controls. The Off and On Time Controls are rotatable and with clockwise rotation result in increased Off and On cycles.

Stainless Steel Degreasers with Automatic Controls

Circo Products Co., Dept. MF, 12117 *Berea Road, Cleveland* 11, *O.*

Automatically controlled vapor degreasers for grease and oil removal

from metal are now being produced by this firm in a number of standard sizes.

The smallest is the electrically operated "Cub," requiring only approximately 18″ x 23″ of floor space, making it practical to locate each one in most advantageous position, confining the vapor degreasing to each or a few operations. Such installations eliminate more costly large machines which may be located far away from many of the operations.

Karbate Heat Exchanger

National Carbon Co., Inc., Dept. MF, 30 *East* 42*nd St., New York* 17, *N. Y.*

National Carbon Company's "Karbate" Impervious Graphite Heat Exchanger, Style FH, Size 1½, is used for heating or cooling corrosive fluids, particularly in tanks with liquid depths up to 16 in. It is designed for horizontal operation and consists of two impervious graphite tubes of 1½″ I.D. x 2″ O.D. in a parallel flow bank between headers. Connections for the heating or cooling medium are made with Neoprene connectors.

Karbate Impervious Graphite has the well-known properties of high thermal conductivity (three times as high as carbon steel) and resistance to the action of most acids, alkalis and other corrosive, solvent or reducing agents, and particularly to all cencentrations of hydrochloric acid and nearly all concentrations of hot sulphuric, phosphoric and acetic acids, wet chlorine and the organic solvents.

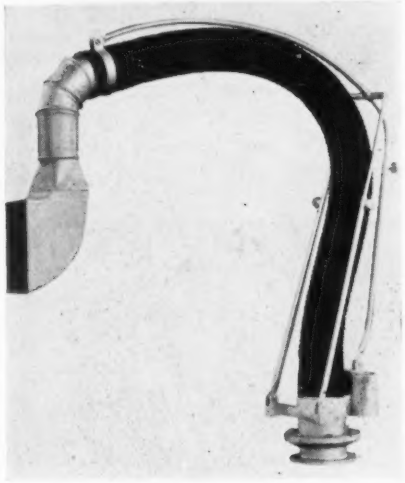
Since the units are assembled from stock items, manufacturing time is materially reduced and quicker deliveries are possible, it is claimed.

Suction Tube Added to Torit Line

Torit Mfg. Co., Dept. MF, 303 *Walnut Street, St. Paul* 2, *Minn.*

Torit has designed new suction tube assemblies for connecting its self-contained dust collectors to wheels on surface grinders, tool and cutter grinders, and other machines that cannot be properly hooded.

Made in 3" x 4" sizes, to fit standard inlet holes, these assemblies have duck covered hose for greater flexibility. The holding framework closely follows the curve of the tubing, and the former overhang of the counter-weight has been largely eliminated. This makes a very compact arrangement and permits placing of the nozzle directly in the



dust stream with a minimum of interference to working operations, according to the firm.

These new suction tube assemblies can be fitted with either vertical or angular type nozzles. For complete information write the manufacturer.

Your Key

To Greater Polishing Profits

Even in a Buyer's Market!

GRIPMASTER

PATENTED

POLISHING CEMENT

- ✓ LONGER WHEEL HEAD LIFE! Up to 47% more pieces per head! Thanks to Gripmaster's special high-heat resisting ingredient!
- ✓ FEWER STOPS FOR WHEEL CHANGES! Gripmaster *locks in* grains of emery "vise tight!"
- ✓ INVENTORIES SIMPLIFIED! One grade grips *all* grains—300 to 20!
- ✓ GREATER FLEXIBILITY gives more and finer "breaks" when wheel is "cracked!"
- ✓ NO DETERIORATION! NO OBNOXIOUS ODORS!
- ✓ IDEAL ON ALL METALS . . . ferrous and non-ferrous . . . on plastics, too!

WITH a buyer's market definitely on the way, it's time to find out how you can increase your polishers' efficiency, reduce costs, produce better finishes. GRIPMASTER gives you the key. Here's how:

Mail Coupon Now!

"First Choice of the World's Best Finishers"

GRIPMASTER DIVISION
NELSON CHEMICALS CORP.
12345 Schaefer Hwy. Detroit 27, Mich., U.S.A.

IN CANADA:
H. C. Nelson Chemicals, Ltd.
Windsor, Ontario

☐ Send us a generous FREE SAMPLE of Gripmaster.
☐ Send us data on how to boost polishing production.

MF-449

COMPANY_____
ATTENTION_____
ADDRESS_____
CITY_____ STATE_____

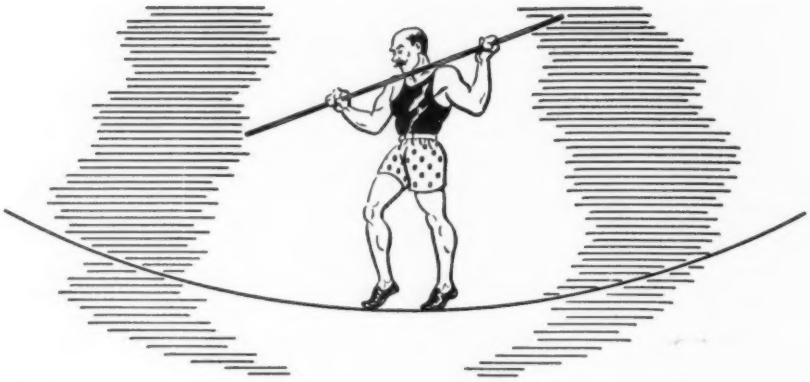
Rust Preventive Wrapper Eliminates Coating of Iron and Steel Products

Nox-Rust Chemical Corp., Dept. MF, 2419 *South Halsted Street, Chicago* 8, *Ill.*

Liquid or grease rust preventive coatings can in many cases be forgotten in the packaging of iron and steel products by simply wrapping the part in the new Nox-Rust Vapor Wrapper which gives complete and lasting corrosion protection, it is claimed. The Nox-Rust Vapor Wrapper is as quick and easy to use as ordinary wrapping paper, and the slow vaporization of a synthetic chemical contained in the wrapper completely surrounds the part with a vapor sheath which in most cases requires no supplementary coating, according to this firm.

The very slow vaporization of the chemical incorporated into the Vapor Wrapper completely covers every surface of the ferrous metal and prevents all corrosive action of both moisture and air, it is claimed. The wrapper need not be sealed or even tightly wrapped to give this protection; it is not necessary for the wrapper to come into contact with the part. Even the

The rusted sleeve and rod, illustrated, were wrapped in ordinary kraft, with a foil overwrap; the bright parts were encased in Nox-Rust Wrapper and foil. Both were exposed to salt spray for two weeks.



YOU don't have to take chances!

You don't have to take chances with the black finishing of your steel parts when you use Du-Lite. If you have hesitated to specify or experiment with black chemical finishes, you need have no doubts about Du-Lite and its uniform, easy workability.

You're right with DU-LITE

Du-Lite processing acts chemically on the surface of the metal producing a beautiful, intense black finish with penetration—not a coating. It will not chip, peel, crack, or blister, nor cause dimensional changes. This tough, black oxide is highly rust-resistant, friction-reducing and long wearing.

While Du-Lite is not the answer to *all* your finishing problems, in many, many cases involving production black finishing of steel and steel alloy parts (not stainless) it has proved to be the best and least expensive to operate.

DO IT RIGHT WITH DU-LITE

Write or Phone Today

A consultation with the Du-Lite Field Engineer in your territory will quickly establish the advisability of your using Du-Lite. He is familiar with diverse problems similar to yours and will be frank in his advice to you.

You may be sure that you can . . . Do It Right With Du-Lite. Write or phone the main office at Middletown.

THE DU-LITE CHEMICAL CORPORATION

110 RIVER ROAD • MIDDLETOWN, CONN.

presence of moisture and water within the package will not cause corrosion because the chemical vapor mixes with the moisture and renders it harmless. Cycling humidity and temperature changes have no corrosive effect when the Vapor Wrapper protects the part, it is said.

Nox-Rust Wrapper itself is an essentially neutral paper, and the vapor arising from it is odorless, non-toxic and is not injurious to the skin. The chemical is said to be very stable and not consumed in preventing corrosion; offers little tendency to escape even when not sealed, and therefore lasts indefinitely. It can be used for the protection of such steel parts as saw blades, bearings, piston rings and sleeves, mechanics' tools, knives, files, lathes, machine tools, cutting tools, taps, dies, drills, sheet steel and bar steel. It can be made into envelopes or other forms to facilitate packaging, and it eliminates the time, trouble and expense involved in coating and cleaning.

Samples and complete information may be secured from the manufacturer.

Cup-Type Safety Goggles

Chicago Eye Shield Co., Dept. MF, 2300 Warren Blvd., Chicago 12, Ill.

A new cup-type goggle claimed to be one of the safest and most comfortable goggles of its kind has been announced by the above firm.

The goggle features newly developed moulded thermoplastic cups. Cups are engineered to fit both left and right eye areas snugly yet gently, and have broad contact surfaces which eliminate "pressure spots," it is claimed.

Another feature of this goggle is the moulded rubber Comfort-King headband, which provides added comfort to wearers. This headband holds the goggle firmly with 30% less tension, it is said. It will not kink, curl or twist, and has no buckles or sharp edges. Patented slip-disc size adjustment is quick and simple.

New Type Overhead Conveyor

Industrial Equipment Co., Dept. MF, 315 N. Ada Street, Chicago 7, Ill.

Chain-O-Flex is a new flexible chain conveyor packaged product for use where a constant flow of material or assembled products is needed.

Quick assembly of any practical conveyor system pattern is a prime feature of Chain-O-Flex, it is claimed. All parts are bolted together. All corners are highly flexible and adjust-

able to any desired degree. Chain-O-Flex increases its efficiency when the number of corners is increased, it is said.

Variable speeds are obtained by adjusting the band wheel on the drive unit which will provide a 3:1 speed ratio. Multiple drive units may be used on extremely long Chain-O-Flex systems. Well guarded by an enclosed design throughout, Chain-O-Flex offers the utmost in safety.

Slurry Filters

Enzinger-Union Corp., Dept. MF, Angola, N. Y.

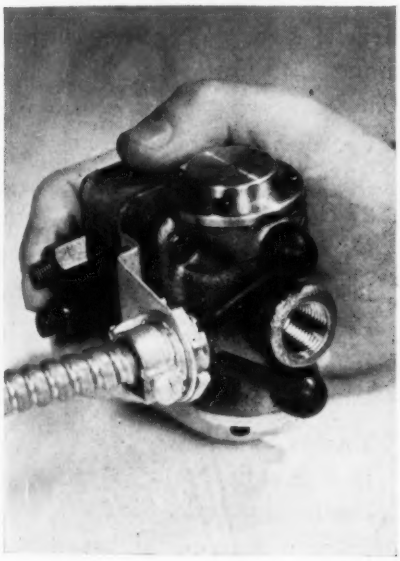
This firm manufactures a line of filter equipment suitable for intermittent or continuous filtration of plating and other chemical processing baths. Filters are available in all metals, and

feature rugged screen construction for long service life. These cylindrical filters are made in sizes from 24" in diameter up to 48" in diameter, with corresponding variations in screen size, area, and capacity. Open slurry tanks are usually used, but pressure type slurry feeders are also available for use with any of the filtering diatomaceous earths available.

High Speed Electrically-Controlled, Air-Powered Valve

The Bellows Co., Dept. MF, Akron, Ohio.

A new solenoid-actuated air control valve which uses the air it controls to operate the valve, has just been announced by the above firm, makers of



pneumatic devices and equipment.

The new valve is immediately available in ¼" and ⅜" port sizes and comes complete with a special transformer to reduce normal line voltage to the required eight volts.

Check
THESE ADVANTAGES . . .

When you consider plating rack insulation check the obvious advantages in using BUNATOL No. 1000—the 100% solids Paste insulation.

1. **Cost of material itself much less than any comparable Plastisol rack insulation.**
2. **Requires only one Primer. A big money saver in labor, investment and time.**
3. **Extra fine adhesion. Holds in all plating solutions and no seep back from contacts.**
4. **Sets up quick and does not run off the rack after dipping. More insulation on the rack and less drip waste.**

Check and compare. Let us insulate a test rack for you (no charge) and you place it in actual service. That will prove that BUNATOL No. 1000 is the best insulation and the lowest in price.

NELSON J. QUINN CO., TOLEDO 7, OHIO

Business Items

Udylite Holds Annual Sales Meeting

More than 75 sales and service representatives of *The Udylite Corporation* met recently in Detroit, Mich., for the Annual Sales Meeting, which was conducted by *L. V. Nagle*, Vice-president in Charge of Sales.

Mr. Nagle announced at the meeting that 1948 represented the greatest year in Udylite history, and with new products and other developments, he

expected 1949 to show a substantial increase over 1948 regardless of the general trend in business toward lower sales.

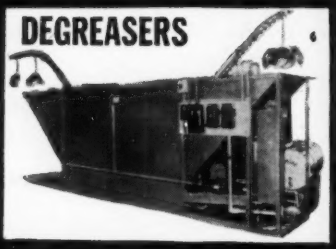
The three-day meeting covered all phases of Udylite business operations, sales, advertising, service, credits, and was finalized with the Udylite Frolics, a show conducted each year from talent at the Udylite factories.

Mr. L. K. Lindahl, President of The Udylite Corp., opened the Sales Convention with a speech of welcome in which he thanked the organization heartily for their outstanding record in 1948.

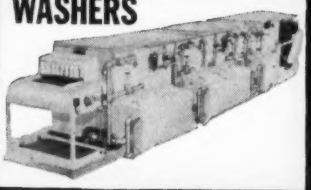
One of the feature events at each Annual Udylite Sales Convention is the presentation of gold watches to employees who have been with the Corporation for a period of twenty years. Illustrated above is the presentation of a watch to *Larry J. George*, Chicago Manager of Udylite by President *L. K. Lindahl*, while *L. V. Nagle* attaches a 20-year Udylite pin.

Is METAL PARTS CLEANING a bottleneck in your plant?

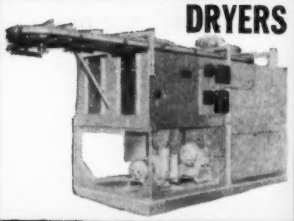
DEGREASERS



WASHERS



DRYERS



A complete line of OPTIMUS Equipment is available in standard and special sizes to meet every metal parts cleaning problem and allied processing applications.

OPTIMUS VAPOR DEGREASERS are available in all various types and stages, straight vapor, vapor-spray, liquid-vapor and combinations of these. All sizes from simple batch type degreasers to custom built monorail or cross rod conveyor models.

OPTIMUS METAL PARTS WASHERS — single or multiple stage — screw or conveyor, mesh belt or monorail types. Can be applied to a wide range of operations as well as the handling of rust preventatives and other coatings.

OPTIMUS DRYERS embody a specially designed system of directional air jets which assure spotless drying after plating or polishing and before subsequent painting, plating or lacquering.

Submit your metal parts cleaning problem to our engineering staff. SEND FOR complete catalog of OPTIMUS Equipment.

Distributors of
"Midsolv"
A Perchlorethylene Degreaser Solvent
"Triclene D"
A Trichlorethylene Degreaser Solvent

SEND FOR
COMPLETE CATALOG AND
ADDITIONAL INFORMATION.

OPTIMUS EQUIPMENT COMPANY
11 Water Street **Matawan, N. J.**
Offices in principal cities

OPTIMUS EQUIPMENT
FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

New Plating Rack Firm

The accompanying photo shows the plant of the *Imperial Plating Rack Co.*, at 800 *Industrial Ave., Flint, Mich.*, makers and designers of all types of plating racks. Complete facilities are available for manufacturing, repairing, and coating racks to customers' specifications. Imperial racks feature replaceable tips and long lasting insulation.

Lea Forms Canadian Subsidiary

Lea Manufacturing Co. of Canada, Limited, has been formed to manufacture and distribute the extensive line of Lea polishing, buffing and burring compositions, including the well known and widely used Lea Compound and Ad-Lea-Sive. Everything made in the Canadian plant is manufactured to original Lea specifications and under the guidance of the Lea Technical Staff of *The Lea Manufacturing Co. of Waterbury, Conn.*, pioneers in the manufacture of compositions.

Officers of the new Canadian Company include: *Dr. Henry L. Kellner*, President; *Earle W. Couch*, Vice President; and *Kergan Wells*, Secretary and General Manager. Factory and office are at 370 *Victoria Street, Toronto 2, Ontario.*

Canadian Distributors are:
Alloycraft Limited,
27 Hillside Avenue, Westmount
Montreal, Quebec, Canada

British American Chemical Co. Ltd.,
Hall Building
789 W. Pender Street
Vancouver, B. C., Canada

Thomas & Son Co.,
16 Walnut St. North
Hamilton, Ontario, Canada

W. W. Wells, Ltd.,
370 Victoria Street
Toronto, Canada

Osborn Appoints Factory Sales Representative

Appointment of *John Clark Alberts* as factory sales representative of the Machine Division of *The Osborn Mfg. Co.*, of Cleveland, is announced by *Leon F. Miller*, sales manager of the company's Machine Division.

Mr. Alberts has been assigned to the Northern Indiana, Illinois, Iowa, Wisconsin and Minnesota area and will make his headquarters in Osborn's Chicago office.

He is a graduate of Taft Prep School and Union College and has been associated with the company for about a year. Previously he served as a First Lieutenant in the U. S. Air Force in the Pacific battle area.

Pennsalt Appoints R. O. White Superintendent

The appointment of *Richard O. White* as superintendent of the Cornwells Heights (Pa.) warehouse and packaging plant of the *Pennsylvania Salt Mfg. Co., Phila., Pa.* has been announced by *Mr. Y. F. Hardcastle,* Vice President of manufacturing.

Mr. White, formerly an area supervisor at Pennsalt's largest plant in Wyandotte, Mich., joined the company in 1945 after serving as a chemist and process supervisor for E. I. duPont de Nemours & Co.

Born in Rutherford, Tenn., Mr. White attended the University of Tennessee and Memphis State College.

H. W. Beldin had been appointed assistant superintendent of Cornwells Heights.

Minnesota Mining Starts New Plant

Production at the former Plancor plant No. 80 at Bristol, Pa., began March 7, according to an announcement by the *Minnesota Mining & Manufacturing Co.,* St. Paul, Minn.

The company purchased the plant last summer from the War Assets Administration. Manager of the unit is *Robert N. Wolfe.*

C. B. Sampair, St. Paul, the company's vice president in charge of production, indicated that there will be 35 or 40 persons employed at first in the production of adhesives and coatings.

In the beginning the office will be staffed by about 10 persons.

Sampair's announcement said that other lines, including some adhesive tapes, will go into production later, and that ultimately the plant will employ about 350 workers.

Townsend Joins American Cladmetals

Leyshon W. Townsend has accepted the post of Assistant to the President of *American Cladmetals Co.,* it was announced by *Joseph Kinney,* Jr., President.

Mr. Townsend began his career in cladmetals in 1934 with the Lukens Steel Company where he served in various capacities in the Production and Customer Service Departments. A Director of Composite Steels, Inc., he will continue in that post and do consultant work with that firm.

Mr. Townsend received his metallurgical training at Pennsylvania State College. He also is a graduate of Girard College in Philadelphia.

In addition to his executive duties, Mr. Townsend will consult with manufacturers of cladmetal products as a customer service.

Gurnham to Head Chem. Engineering at Tufts

The appointment of *Dr. C. Fred Gurnham* as chairman of the Department of Chemical Engineering in the Tufts School of Engineering was announced recently by the Trustees of Tufts College. Dr. Gurnham assumed his new duties on March 1st.

A graduate of Yale University with the degree of bachelor of science in chemical engineering, Dr. Gurnham holds a masters degree and a doctor of engineering science degree in chemical engineering from New York University. He is a licensed engineer in New York State, New Jersey and Connecticut.

A native of Ludlow, Mass., Dr. Gurnham most recently has been conducting his own consulting engineering practice in New Haven, Conn., a practice which he is still continuing.

His research papers in the field of chemical and sanitary engineering have been published in leading technical journals. He is chairman of a committee, sponsored by the American Electroplaters' Society, dealing with problems in the field of electroplating.

Vonnegut to Concentrate on Metal Finishing Equipment

The Vonnegut Moulder Corp., 1819

CHROMIC ACID

99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and over a hundred years of technical background, Mutual is the world's foremost manufacturer of Chromic Acid.

MUTUAL CHEMICAL CO. NEW YORK

OVER A CENTURY OF CHROMIUM CHEMICAL PROGRESS

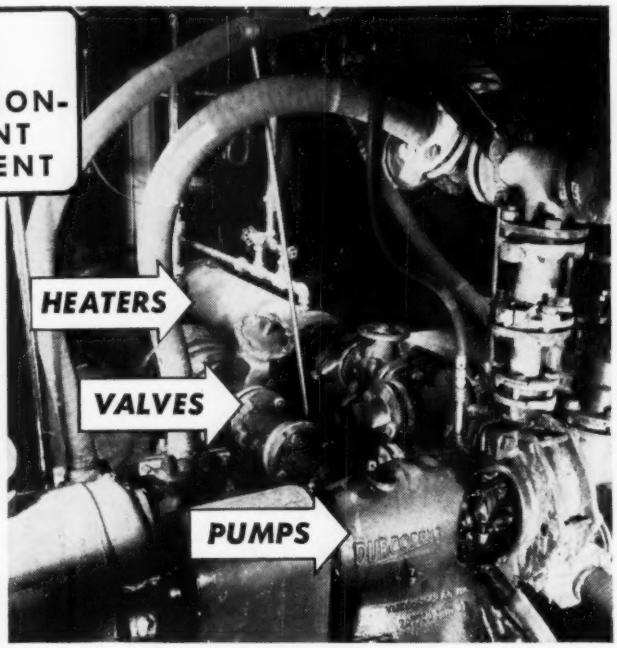
Sodium Bichromate

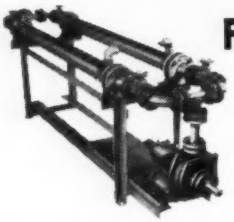
Potassium Bichromate

MUTUAL CHEMICAL COMPANY OF AMERICA

270 MADISON AVENUE NEW YORK 16, N.Y.

DURCO
CORROSION-RESISTANT EQUIPMENT





Standard Durco "packaged" units are available with one to nine or more heat exchangers in banks—together with the necessary corrosion-resistant valves, pipe, fittings and pumps—supported on one frame. For further information on typical layouts ask for folder T.

FOR CORROSIVE PLATING SOLUTIONS

These Durco heat exchangers, pumps and valves safely handle Watts nickel plating solution at the Lukens Steel Co., Coatesville, Pa.

Durco equipment is able to withstand corrosive service like this because every part that comes in contact with the corrosive is made of DURIRON. This Durco high silicon iron is completely resistant to practically every plating solution....copper, chrome, nickel and others.

For maximum plating service with minimum maintenance, specify Durco equipment.

For further information—on Durco valves write for Bul. 610; on Durco pumps write for Bul. 815; on Durco heat exchangers write for Bul. 1603.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON CO., INC., DAYTON 1, OHIO
Branch Offices in Principal Cities

DURCO Adv. 68-GM

Madison Ave., Indianapolis, Ind., is reported to be preparing improved facilities for production of the Marschke Line of Grinders and Buffers, after selling its woodworking machine division.

The sale of this division will permit the firm to give more space and effort to its production of the Marschke Line. which now includes pedestal type, floor stand and swing frame grinders and buffers in sizes with motor capacities ranging from 1 HP to 40 HP. Plans also include new developments and increased production of the Vonnegut Brush-Backed Sander and Abrasive Head, a combination of tampico brushes and coated abrasive cloth in a wheel, for sanding and polishing curved surfaces and irregularly shaped wood, plastic and metal work pieces.

The Vonnegut wheel head is claimed to do an effective job of cutting and at the same time to be softer and have more yielding action for getting into depressions and riding over raised areas of surfaces than a built up fabric type of polishing wheel.

Water Conditioning Firms Join Forces

News in the water conditioning field is the recent announcement that *Elgin Softener Corporation, Elgin, Illinois,* and *Illinois Water Treatment Company, Rockford, Illinois* have joined forces.

In commenting upon the new alignment, *Chester T. McGill,* who heads the Elgin organization, explained that the over-all purpose is to provide a better, more complete water conditioning service at minimum cost to the user.

Under the new set-up, each company will maintain its name identity and personnel. Mr. McGill is widely recognized for his development of the zeolite softener of "double-check" design and other advancements in the water conditioning field. Associated with him in the organization are such well-known men as *E. W. Scarritt, C. Scribner* and *B. F. Willey,* each of whom has had some 20 years' experience in the field. *W. S. Morrison* and *P. H. Caskey,* of Illinois Water Treatment, pioneers in the development of de-ionizers, are recognized authorities in the field of ion exchange.

The management states that through consolidating manufacturing operations, production economies are being accomplished which can be passed on to the user. An important part of the plan is an integration program which will greatly broaden the scope of services available through a nation-wide organization of sales engineers and technical field men with offices in forty principal cities. This will permit close personal attention to be given all phases of water conditioning, including special ion-exchange problems.

Two Join Arthur D. Little, Inc.

Professor Thomas K. Sherwood, Dean of Engineering of Massachusetts Institute of Technology, and *Dr. Bruce S. Old* of the staff of Arthur D. Little, Inc., were today elected to the Board of Directors of *Arthur D. Little, Inc., Cambridge, Mass.,* research and engineering organization. Mr. R. C. Griffin retired as Director and as As-

Prof. Thomas K. Sherwood

Dr. Bruce S. Old

sistant Secretary under the Company's regular retirement plan.

Dean Sherwood was with the Chemical Engineering Department of MIT for several years before his appointment as Dean in 1946 and is the author of many publications on chemical engineering subjects. During the war he worked actively with the National Defense Research Committee and other Government research groups; in appreciation of this work he was awarded the U. S. Medal for Merit in 1948.

Dr. Old joined Arthur D. Little, Inc., in 1946, after leaving the U. S. Navy, where he served in the Office of Research and Invention, with the rank of Commander. He is now in charge of process metallurgy for Arthur D. Little, Inc., and is also consultant to the Office of Naval Research and the Atomic Energy Commission, in the latter as Chief of Metallurgy and Materials Branch, Division of Research.

Mathieson Makes Sales Personnel Changes

Mathieson Chemical Corp. announces three recent changes in personnel. *Roland F. Boehm,* who was District Sales Manager of the Houston, Tex., office, has been transferred to the ammonia department, with headquarters in the company's New York offices. *O. J. Theobald, Jr.,* formerly District Sales Manager of Mathieson's Charlotte, N. C., office, replaces Mr. Boehm as District Sales Manager of the Houston office. *J. F. Carey,* formerly a sales representative in the Charlotte territory, has been named District Sales Manager of the Charlotte office.

Mr. Boehm joined Mathieson in 1946. Previously he held positions with the War Production Board, as Assistant Chief of the Nitrogen Unit, and, after a period of service in the Armed Forces, with Nitrogen Products, Inc., in an executive capacity.

Mr. Theobald joined Mathieson in 1932 as a member of the sales staff. He is a graduate of Purdue, and a member of the American Chemical Society and the American Association of Textile Chemists and Colorists.

Mr. Carey received his chemical degree from Tufts College and shortly after his graduation in 1937 joined Mathieson where he has been active in sales and sales development. He is a member of the American Chemical Society and the American Association of Textile Chemists and Colorists.

New York Area Contract Plating Shops Report Business Activity Down

The February report of the Master's Electroplating Association shows a rate of activity for the week ending Feb. 26th of 46.5%, as against a figure of 52% for the same month last year. Sixty-six shops were included in this report, and only one shop reports working extra shifts and seven shops worked overtime.

Mr. Frank Kaiser, of the Long Island Mechanical Plating Co., was recently elected Chairman of the Executive Committee of the Association for 1949.

Highest stabilized degreasing solvent

—Stabilized NOT Alkalized

Years of research and development have produced this outstanding new BLACOSOLV. This new product has been subjected to the most rigorous stability tests for the most difficult jobs. Contains no alkaline materials which neutralize acid *after* breakdown. The new stabilizers *prevent* solvent breakdown and possible acid formation.

The new BLACOSOLV will degrease scientifically all metals or combinations of metals. You need not pay premium prices for special solvents for different metals. Blacosolv can be used over and over without impairing its high qualities.

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

Houghton President Celebrates 45th Anniversary with Company

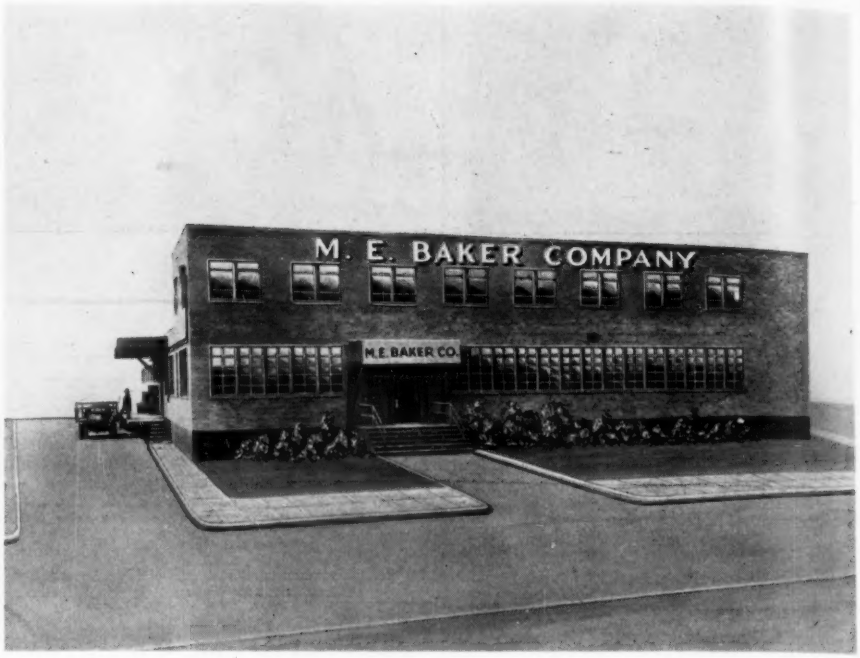
Major A. E. Carpenter, president of *E. F. Houghton & Co.*, manufacturer of industrial oils, chemicals and leathers, celebrated his 45th anniversary with the company this week.

His father, Charles E. Carpenter, was with the company for 49 years, and served as president up to his death in 1929. His grandfather, Aaron E. Carpenter, who helped to found the company in 1865, headed it for 49 years.

Mr. Carpenter's service with Houghton was interrupted for two years during World War I, when he served overseas in the Army. He was commissioned a Major while abroad.

Aside from his business activities, Mr. Carpenter is well known as a big game fisherman. He has held world records in both tuna and marlin catches off the New Jersey coast. When the fish aren't running, he spends much of his time with his stamp collection which includes one of the largest groups of New Zealand stamps containing advertising messages in the world.

M. E. Baker Co. Moves to New Plant



The *M. E. Baker Co.*, distributors of electroplating equipment and supplies, have recently moved to new quarters at 25 *Wheeler St., Cambridge* 38, *Mass.* The accompanying photo shows their new building, which will house both the offices and warehouse facilities, and which has a private railroad siding which will enable them to expedite deliveries of all items and render faster

DAVIS - K GOLD PLATING SOLUTIONS HEADQUARTERS

• Made in All Colors
• Colors Constant
• Brilliant Finish
• Tarnish Resistant
• Bottled By Troy Weight
• Made From U. S. Treasury Gold
• Ready For Immediate Use
U. S. Government Treasury Gold
999.9

Davis-K's years of experience in the manufacture of Gold Plating Solutions, have developed and produced for the plater, a Gold Plating Solution that is effortless and fool-proof in its handling. Easily understandable too, since "experience is the best teacher" and only "Certified U. S. Government Treasury Gold" and the highest quality (C.P.) Chemicals are used. Davis-K Gold Plating Solutions are bottled by Troy weight in all "color-constant", popular shades. Are tarnish-resistant and ready for immediate use. When you're thinking of gold plating or have a plating problem—call on Davis-K!

DAVIS-K Service

Our service today with its newly expanded facilities is fast and efficient. We are fully equipped to reclaim your old gold, rhodium and silver solutions. Phone or write your precious metal plating problems. We welcome them!

RHODIUM Plating Solutions

Davis-K are distributors of Bakers' lustrous RHODIUM solutions, that produce a long-lasting white finish.

"Where Glittering Elegance Reflects Lasting Quality."

100% PURE GOLD DKP PRECIOUS METAL SOLUTION

DAVIS-K PRODUCTS CO.

54 West 22nd St. ORegon 5-0094-5 New York 10, N. Y.

service to their many customers. The building is 100 ft. by 180 ft. and contains over 20,000 square feet of space. The company is a distributor for the country's leading manufacturers of plating equipment and supplies, and also maintains a large stock of used equipment.

Pennsalt President Reelected Member of Conference Board

Leonard T. Beale, president of the Pennsylvania Salt Manufacturing Co., was re-elected a member of the National Industrial Conference Board for the forthcoming year at the Board's 302nd meeting held recently in New York.

Active in the work of the Conference Board for many years, Mr. Beale first was elected to the Board in 1948. Founded in 1916 as an independent and non-profit institution for research and education in the fields of economics and business, the Board is supported by nearly 3,000 business concerns, trade associations, labor unions, Government bureaus, libraries, colleges and universities.

International Nickel Appoints New Officers

Robert C. Stanley, Chairman of the Board of Directors of *The International Nickel Company of Canada, Limited,* has announced the following executive rearrangements in the Company:

Mr. Stanley, President since 1922, Director since 1917, and Chairman and President since 1937, continues as Chairman of the Board.

Dr. John F. Thompson, Executive Vice President since 1936, and a Director and member of the Executive Committee since 1931, has become President.

Dr. Paul D. Merica, Vice President since 1936, and a Director, has become Executive Vice President. *Henry S. Wingate,* Secretary since 1939, and a Director, has become a Vice President and continues as Secretary. There was no change among the other officers of the Company.

Wyandotte Chemical Buys Tract in Ohio

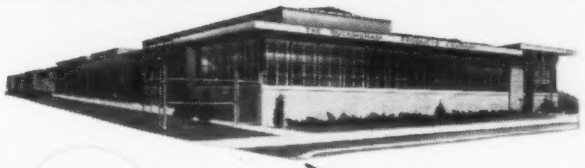
Wyandotte Chemicals Corp., of *Wyandotte, Mich.,* has recently acquired approximately 200 acres of land at Dilles Bottom, Ohio, ten miles south of Wheeling, West Virginia. Included in the new property is a 2300-foot frontage on the Ohio River. Although no immediate construction is contemplated, the new site was acquired for future additions to the corporation's organic chemical facilities, and for expansion of their electrolytic chlorine and caustic soda plants. The new site at Dilles Bottom, Ohio, has natural resources of salt, coal, oil, gas and water either on or adjacent to the property. Rail, highway and barge transportation are available as is also electric power.

Acquisition of property in the fast growing Upper Ohio Valley chemical center gives the Wyandotte organization its seventh production location—parent plants at Wyandotte; limestone quarries at Alpena, Michigan; coal mines at Curtisville, Pennsylvania; geologic deposits at Calvert, Kansas and Buckman, Mississippi and The Natural Soda Products plant at Keeler, California.

Ceilcote Names Chicago District Manager

The *Ceilcote Co., Cleveland,* corrosion proofing specialists, have appointed *Leo E. Gatzek* as District Manager for the Chicago territory including Illinois, Wisconsin, Missouri and Western Indiana. Mr. Gatzek had been with the manufacturing research divi-

Here's the Home of
BUCKINGHAM
STAINLESS STEEL
BUFFING COMPOSITIONS



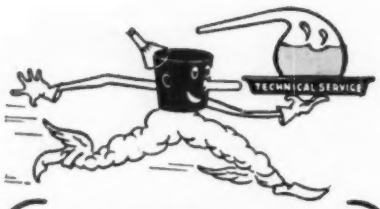
These are our Leaders

K 235
K 226
K 207
K 444

Write for Samples

REPRESENTATION FROM COAST TO COAST

The BUCKINGHAM PRODUCTS *Co.*
14100 FULLERTON AVE. • DETROIT 27, MICH.



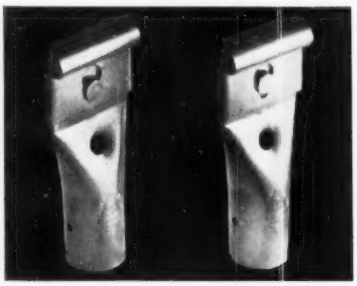
LUSTER-ON®

a finish

Superior to Cadmium

at half the cost

If you're using hard-to-get, over-priced cadmium, you'll be interested in this superior finish . . . *LUSTER-ON on zinc!* Better than cadmium for most uses, Luster-on costs about half as much to use and is always available. A simple Luster-on dip at the end of your zinc plating line gives your product a finish that's permanently chrome-bright, rust and corrosion proofed — that resists handling smudges and age stains.



Shown here are two unretouched photographs of a Stanley Home Product. One has been zinc plated and Luster-on dipped. The other has been cadmium plated. CAN YOU TELL WHICH IS WHICH?*

These comparative photographs *prove* conclusively that Luster-on on zinc is equal in looks to cadmium. A long list of successful users proves that Luster-on is *superior* to cadmium when you check out final results and costs.

Write for the Luster-on booklet that gives you full information and includes a cost analysis of Luster-on on zinc vs. cadmium. It's yours for the asking, at no obligation.

SEND COUPON TODAY 50

**The one at the right is Luster-on dipped.*

The Chemical

CORPORATION

54 Waltham Ave., Springfield, Mass.

Send me the Luster-on booklet and cost analysis.

Name .....

Firm .....

Title .....

Address .....

I am ( ) am not ( ) sending you a sample for free Luster-on dip.

sion of the International Harvester Company for some time. His background is almost entirely in the field of engineering and he is a licensed professional engineer in the state of Illinois. The company places great emphasis on the design and use of its acid and alkali proof lining, cements, brick and protective coatings, and engineering experience is an important factor in selling these materials.

Aluminum Giftware Firm Opens New Plant

A new plant at Edgertown, Ohio, has recently been opened by the *J. H. Christil Co.*, manufacturers of aluminum giftware, and includes one of the largest anodizing installations in the country. Their previous plant at Indianapolis was destroyed by fire on November 7th. *Mr. Joseph H. Christil* is President of the firm.

Obituary

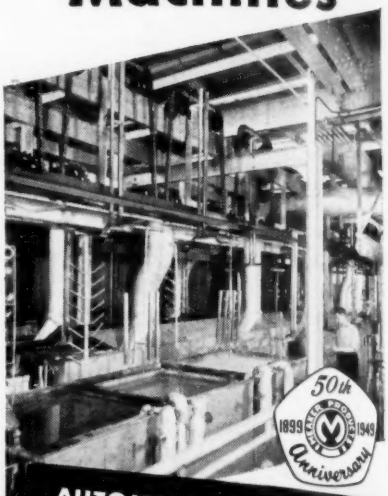
Alexander M. Robson

It is with deepest regret that we announce the passing of *Mr. Alexander M. Robson*, a partner and founder of the *Reynolds-Robson Supply Co.*, of Philadelphia. Mr. Robson and Mr.

W. A. Reynolds became partners in the plating supply business in 1923. but after Mr. Robson's illness in 1945 he withdrew from the firm, his interests being taken over by his son, *Mr. Delmar R. Robson*. During his 22 years in the field Mr. Robson built up a large circle of friends through his helpful and friendly manner, and his many acquaintances and associates will miss him.

MEAKER

Electroplating Machines



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Letters to the Editor

Mesle Chord Method for Plating Thickness

Dear Editor:

When the chord method for measuring the thickness of plated coatings is under discussion, nearly always it is stated that this method is not very accurate for thicknesses of .0002" or less. The latest to come to my attention is in the November issue of *Metal Finishing*—Engineering Data sheet. It is also frequently stated that a precision grinder is a must if this method is used for measuring coating thickness on flat surfaces.

These two points grow out of the report made by *Wm. Blum* and *A. Brenner* of the National Bureau of Standards when they studied the merits of this method. The conclusions they reached were no doubt correct for the conditions under which they worked, such as using a precision grinder and an 8" emery wheel as the cutting medium. The use of an emery wheel also tends to smear rather than cut the soft metals such as zinc and lead, making accurate measuring of the width of the cut or chord difficult.

Neither the use of a precision grinder nor an emery wheel are necessary for the successful use of the chord method.

Fig. 1. Fixture for holding file when making chord measurement of plating thickness by Mesle method.

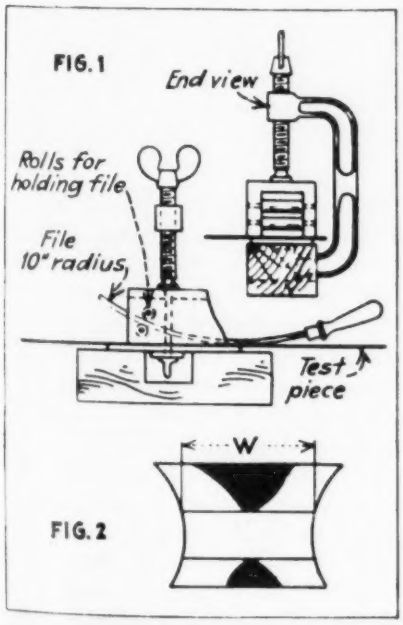

Fig. 2. In this outline of a file cut, the black areas represent base metal, the light area the plating that has not been cut through by the file.

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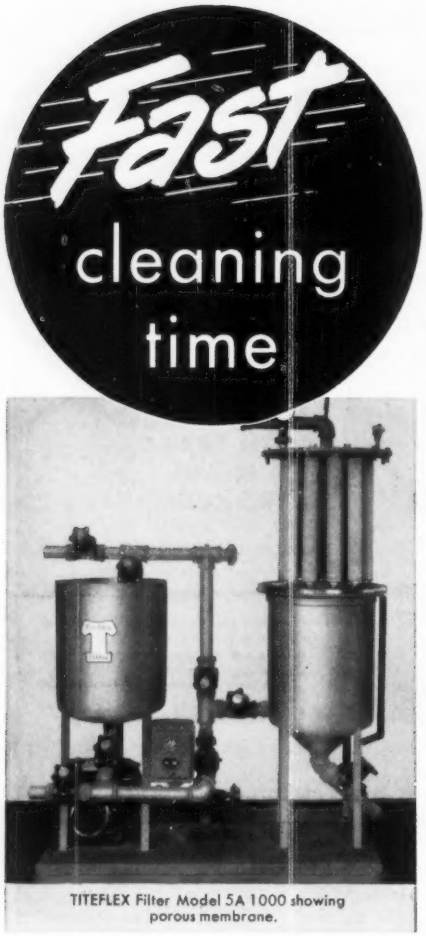
It is evident that the larger the radius of the cutting medium the wider will be the chord cut, and the wider the chord cut, the more accurately can the thinner thicknesses be measured. There doesn't have to be any limit to the size of the radius of the cutting medium, therefore very thin coatings on the flat surfaces may be measured with a fair degree of accuracy.

A short time after the Blum & Brenner report, I developed the use of a curved file and a bench fixture that enabled me to use a 10" radius cut. This made possible the measuring of a .00005" thickness as accurately as Blum & Brenner measured a .0002" thickness. There is no reason why a 20" radius cutting medium may not be used, thus further increasing the accuracy for still thinner coatings.

A sketch of the curved file and holding fixture, Figure 1, shows how the file is constrained to move along the curved path of the radius of the curved file, be it 4", 10" or 20". This simple fixture and curved file takes the place of a precision grinder and emery wheel. Figure 2 of the sketch indicates the nature of the cut made thru the plated coating. "W" is the width of the chord.

Curving the file tends to cause the flat file to curve slightly toward the edge. This causes the cut made to be heavier at edge of file, producing the



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Thickness and Weight of Plating—File Test Method

Width of Chord	*Thickness in inches*	*Weight of Metal Plated per Sq. Ft. of Surface*						
		Dwt. Silver	*Dwt. Gold*	*Oz. Nickel*	*Oz. Copper*	*Oz. Zinc*	*Oz. Cadmium*	*Oz. Chromium*
0.025	0.000008	0.13	0.23	0.006	0.006	0.005	0.006	0.005
0.037	0.000017	0.27	0.50	0.012	0.012	0.010	0.012	0.010
0.050	0.000031	0.50	0.90	0.023	0.023	0.018	0.022	0.018
0.062	0.000050	0.80	1.46	0.036	0.036	0.029	0.036	0.029
0.075	0.000070	1.12	2.04	0.051	0.051	0.040	0.050	0.040
0.087	0.000096	1.53	2.80	0.070	0.070	0.056	0.068	0.056
0.100	0.000125	2.00	3.65	0.091	0.092	0.073	0.089	0.073
0.112	0.000160	2.56	4.67	0.117	0.118	0.093	0.114	0.093
0.125	0.000195	3.12	5.70	0.142	0.143	0.114	0.139	0.114
0.137	0.000236	3.77	6.88	0.172	0.173	0.138	0.169	0.138
0.150	0.000281	4.50	8.20	0.205	0.207	0.164	0.202	0.164
0.162	0.000331	5.29	9.63	0.241	0.243	0.193	0.236	0.193
0.175	0.000383	6.13	11.18	0.280	0.282	0.228	0.274	0.228
0.181	0.000439	7.02	12.81	0.321	0.323	0.256	0.314	0.256
0.200	0.000500	8.00	14.60	0.366	0.368	0.292	0.357	0.293
0.212	0.000565	9.04	16.48	0.413	0.415	0.330	0.404	0.330
0.225	0.000646	10.34	18.85	0.472	0.475	0.377	0.462	0.377
0.237	0.000705	11.28	20.57	0.515	0.515	0.412	0.504	0.412
0.250	0.000781	12.50	22.79	0.571	0.574	0.456	0.558	0.456
0.262	0.000861	13.77	25.12	0.630	0.633	0.503	0.616	0.503
0.275	0.000945	15.12	27.58	0.691	0.695	0.552	0.675	0.552
0.287	0.001033	16.52	30.14	0.755	0.759	0.603	0.739	0.603
0.300	0.001125	18.00	32.83	0.823	0.828	0.657	0.805	0.657
0.312	0.001220	19.52	35.60	0.894	0.898	0.713	0.873	0.713
0.325	0.001320	21.18	38.60	0.966	0.975	0.785	0.945	0.785
0.337	0.001423	22.76	41.53	1.04	1.05	0.837	1.02	0.837
0.350	0.001531	24.50	44.68	1.12	1.13	0.895	1.09	0.895
0.362	0.001645	26.32	48.00	1.20	1.21	0.960	1.18	0.960
0.375	0.001757	28.11	51.24	1.28	1.29	1.02	1.26	1.02
0.387	0.001877	30.03	54.78	1.37	1.38	1.10	1.34	1.10
0.400	0.002000	32.00	58.37	1.46	1.47	1.17	1.43	1.17
0.417	0.002180	34.88	63.65	1.59	1.60	1.27	1.56	1.27
0.425	0.002257	36.11	65.87	1.65	1.66	1.32	1.61	1.32
0.437	0.002392	38.27	69.81	1.75	1.76	1.40	1.71	1.40
0.450	0.002531	40.50	73.68	1.85	1.86	1.48	1.81	1.48
0.462	0.002673	42.76	77.01	1.95	1.96	1.56	1.91	1.56
0.475	0.002820	45.12	82.30	2.06	2.07	1.65	2.02	1.65
0.487	0.002970	47.52	86.67	2.17	2.18	1.73	2.12	1.73
0.500	0.003125	50.00	91.20	2.29	2.30	1.85	2.23	1.85
0.512	0.003276	52.40	95.61	2.39	2.41	1.95	2.34	1.95
0.525	0.003445	55.12	100.50	2.52	2.53	2.05	2.46	2.05
0.537	0.003604	57.66	105.18	2.63	2.65	2.14	2.58	2.14
0.550	0.003781	60.50	110.34	2.76	2.78	2.25	2.70	2.25
0.562	0.003948	63.17	115.22	2.88	2.90	2.35	2.82	2.35
0.575	0.004133	66.12	120.62	3.02	3.04	2.45	2.95	2.45
0.581	0.004307	68.91	125.70	3.15	3.17	2.56	3.07	2.56
0.600	0.004500	72.00	131.33	3.29	3.31	2.67	3.22	2.67
0.612	0.004681	74.89	136.61	3.42	3.44	2.78	3.34	2.78
0.625	0.004882	78.82	142.48	3.57	3.59	2.90	3.49	2.90
0.637	0.005072	81.15	148.02	3.71	3.73	3.01	3.63	3.01
0.650	0.005281	84.50	154.12	3.86	3.88	3.14	3.78	3.14

shape of cut shown in Figure 2. This makes for easy reading of the point at which to measure the width of the chord cut.

When measurements are made on a curved surface by a flat cutting medium, the radius is fixed by the radius of the surface which limits the degree of accuracy for the very thin coatings.

The accompanying table may be used as a short cut to indicate thickness of coating, and metal plated per square foot area when the width of the chord has been measured.

Very truly yours,

FRANK C. MESLE,
Works Laboratory,
Oneida Ltd.

Dear Editor:

In response to your request for further information on copper plating over chrome plating, viz: "Shop Problems" article titled, "Copper Plating Over Chrome" on page 77 of the February, 1949 issue of "Metal Finishing," I would suggest using the type solution preferred for plating on stainless steels.

This solution is composed of 32 oz/gal of a nickel chloride and 1 pt/gal of hydrochloric acid and is used at 72° to 80°F with 6 volt pressure. Nickel or carbon anodes may be used. This solution will produce an adherent nickel deposit directly onto the chromium plate.

Following this nickel flash, the parts

may be copper plated either from a cyanide or an acid type bath—the acid type bath being preferred for best adhesion. You have mentioned this nickel solution in your July and August, 1946 issues.

Yours very truly,

A.G.B.

NEW BOOKS

Journal of the Electrodepositors Technical Society—Vol. 22 1946-7

Published by the Electrodepositors Technical Society, 27 Islington High St., London N1, *Eng. Price* 2 *Guineas.*

Contains the complete papers and discussions presented before the various meetings of the society during 1946-47 as follows:

A New Time-of-Gassing Test of Thickness of Cadmium Coatings on Small Parts, by *S. G. Clarke & J. F. Andrews.*

Effect of Small Amounts of Zinc in Watts Type Nickel Baths, by *G. E. Gardam.*

Effect of Copper on Nickel Deposition, by *G. E. Gardam.*

Methods of Analysis of Chrome Plating Solutions, by *F. W. Salt.*

Analysis of Cobalt-Nickel Bright Plating Baths, by *F. W. Salt.*

Anodically Stripping Deposits from One Side of a Sheet for Analytical Purposes, by *J. W. Price.*

Electropolishing Aluminum Alloys, by *U. R. Evans & D. Whitwham.*

Factors Affecting the Distribution of Electrodeposits, by *N. A. Tope.*

Metallizing of Glass and Plastics, by *P. B. Upton.*

Electrolytic Polishing of 18-8 and Nickel Silver, by *H. Evans & E. H. Lloyd.*

Effect of Base Metal on the Deposition of Brass, by *W. D. Rae.*

Electroplating Shop Cost Methods, by *A. W. Wallbank.*

Application of Photoelectric Absorptiometer to the Analysis of Chrome Plating Baths, by *W. J. Bayley & H. E. Styles.*

Smoothing Action as a Mechanism in Bright Nickel Plating, by *G. E. Gardam.*

Adhesion of Nickel Deposits to Aluminum Alloys, by *W. Bullough & G. E. Gardam.*

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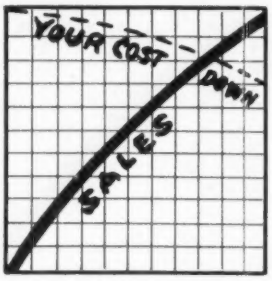

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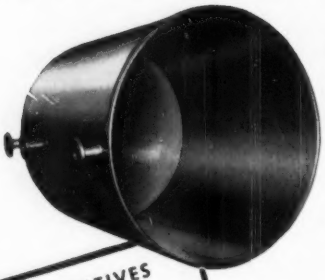

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Pre-Treatment of Zinc Die-Castings for Plating, by *P. Berger.*

Treatment of Plating and Pickling Wastes, by *E. W. Mulcahy.*

The Metallization of Plastics

By *Dr. J. R. I. Hepburn. Published by Cleaver-Hume Press, Ltd., 42a South Audley Street, London W. 1, Eng. Price 6s.* Book size 5" x 7¼", 71 pages of text, 8 figures, 4 plates.

Dr. Hepburn is the Past President of the Electrodepositors Technical Society.

It is encouraging to read in the introduction to Chapter 1 that the author recognizes the fact that "a larger amount of material has been published in the United States," and the probable reference in mind was the work of the present reviewer, which is the well known book "Metallizing Non-Conductors."

Chapter 2 deals with the methods of plating plastics, in which films of silver are formed by precipitation on the given surface, then plated from different types of acid or alkaline solutions of copper and finished in a suitable metal plating bath.

Chapter 3 refers to the common forms of metal spray methods, wherein the metal is sprayed molten in the form of a wire suitably heated to its molten condition, or in the form of a powder, an alternative means.

Chapter 4 deals with "cathode sputtering and vacuum evaporation processes."

Chapter 5 discusses the general physical properties of the metal films as formed by the methods described in the previous chapters.

At the end of each chapter there is given a short bibliography of the literature.

The book may be regarded as one for use as "light reading" and useful in a library as such.

SAMUEL WEIN

Standard Metal Directory

Atlas Publishing Co., 425 *W. 25th St., N. Y.* 1, *N. Y. Price* $15.00.

This is the eleventh edition of this directory, and the new volume contains 999 pages, bound in cloth, 6 x 9¼". The directory is divided into five sections, embracing iron and steel plants ferrous and non-ferrous metal

foundries; metal rolling mills; smelters and refiners of non-ferrous metals, and a new section called "Metal Products Index" which lists geographically distributors of steel and metal products, arranged according to commodities.

The directory contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and non-ferrous metal plants, located in the United States and Canada. The plants are listed geographically and alphabetically. The reports give the name of the company, its capitalization, location of plants, company's officers, purchasing agent, sales manager, plant equipment, products manufactured and type of primary and secondary raw materials consumed. The directory also contains special lists of producers and distributors of pig iron, ores, ferroalloys; metal powder producers and sellers; smelters of primary and secondary non-ferrous metals; storage battery manufacturers; galvanizing plants; railroad purchasing agents; aircraft manufacturers; dealers in used pipe and rails; scrap iron and scrap metal dealers; importers and exporters.

The directory is a valuable reference for the steel and metal industries and is of special value to purchasing agents and manufacturers.

Prevention of Iron and Steel Corrosion

By C. Dinsdale. Price 5 Shillings plus postage. Published by The Louis Cassier Co., Ltd., Dorset House Stamford St., London S.E.I., England.

There exists in the world a considerable number of processes and published specifications relating to the prevention of the corrosion of iron and steel. This book is an attempt to compile a complete index of such methods and the standard specifications connected therewith.

For convenience the matter is divided into three parts dealing respectively with methods of preventing corrosion (broken down into eleven groups), cleaning metal parts and codes of practice. The two appendixes deal with authorities issuing specifications and with paint and paint component specifications.

Contents include:

Part I—*Methods of Preventing Corrosion:* Metallic Coatings—Oxide, Chromate and Phosphate Coatings—

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Part II—*Cleaning Metal Parts.*
Part III—*Codes of Practice.*

Appendix—Authorities Issuing Specifications, and Paint and Paint Component Specifications.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Public Relations Program for Electroplating Industry under Consideration

A public relations program for the entire electroplating industry in the United States was considered in a recent meeting of a Special Advisory Committee of the American Electroplaters' Society. *S. S. Johnston,* President of the Society, appointed the Committee to study this special problem.

"Electroplating is a big industry now," stated *W. M. Phillips,* Chairman of the Committee, and Head of the Electrochemistry Department of General Motors Research Laboratories, Detroit, Michigan. "This Committee has been assigned the problem of recommending to the Society a series of steps which will provide information for the manufacturing and general public about electroplating as a finish. Need for such a program by this industry has long been felt."

The recommendations of the Committee will be taken under advisement by the A.E.S. Executive Board before final policy on the matter is announced.

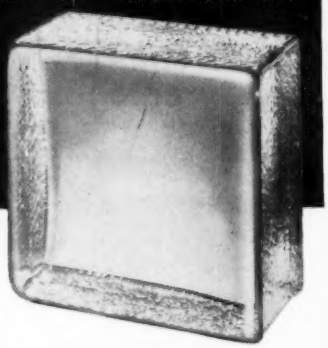
The committee is shown above at a recent meeting in Detroit. Left to right, members are: *C. F. Nixon,* Director of Process Engineering, Fisher Body-Ternstedt Div., General Motors Corp., Detroit, Mich.; *L. M. Hague,* President, Hanson-Van Winkle-Munning Co., Matawan, N. J.; *D. X. Clarin,* District Manager, Oakite Products, Inc., New York, N. Y.; *W. M. Phillips,* Chairman of the Committee and Head of the Electrochemistry Department, General Motors Research Laboratories, Detroit; *R. M. Shock,* Executive Secretary, National Association of Metal Finishers, Detroit; *A. R. Putnam,* A.E.S. National Office, Jenkintown, Pa.

Tenth Annual New England Regional Meeting

The Springfield Branch will be the hosts this year to the other Branches in the New England area for the 10th Annual Regional Meeting, to be held

Now... Immediate deliveries on
SOLID PC GLASS BLOCKS

Ideal, long-lasting supports for acid or electrolytic tanks



● Impervious to moisture, vapor and the fumes of most common acids, PC Solid Glass Blocks are the preferred insulating supports for acid or electrolytic tanks.

These solid glass units are non-corrosive; have an ultimate compressive strength of 80,000 lbs. per sq. in. under uniform loading. They have stippled edges and clear faces—one flat and one dished. Dimensions are 5" x 5" x 2⅝". For complete information, write Pittsburgh Corning Corporation, Dept. J-39, 307 Fourth Ave., Pittsburgh 22, Pa.

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COLOR RANGE SIMULATES FROM 14 KT. TO A PINK GOLD COLOR

SPEKYELLO is easy to operate . . . produces a uniform color, eliminates troublesome color matching . . . has extremely high throwing power, plates uniformly on flat surfaces and deep recesses. Plates directly over brass, copper, nickel, german silver, iron and steel; also over all hard solders and most soft solders. Can be used as an underplate.

NOTE: SPEKYELLO is a Triple Metal Alloy Plate.

Write today for Bulletin No. MF

SPEC SPECIAL CHEMICALS CORP.
30 IRVING PLACE, NEW YORK 3, N. Y.

on April 30th at the Hotel Kimball, Springfield, Mass. The technical sessions will get under way at 2 p.m., and an outstanding group of speakers has been provided. The banquet will be held in the evening following the technical sessions. Chairman for the event is *Mr. E. I. Dupuis*, of the Ames Plating Co., Chicopee, Mass. Tickets covering the entire day's activities are $5.00 each, and may be obtained by writing to Mr. Lawrence Fountain, 15 Cortland St., Springfield, Mass.

Chicago Branch

The February meeting of the Chicago Branch of the American Electroplaters society was held at the Atlantic Hotel on Feb. 11th. About 110 members and guests turned out to hear *Mr. H. J. Davis*, of the Udylite Corp. talk on "Automatic Plating Equipment." The most profitable part of Mr. Davis' talk were the points brought out on the economic advantages of automatic equipment over a period of years, as compared to conventional hand methods of moving work thru the various cleaning and plating operations. Some of these points were:

1. Usually floor space is saved.
2. Original installation of services such as electricity, steam, and water run is considerably less than with separate tanks.
3. Size of racks can be built to fit the equipment rather than limited by what an operator can handle.
4. Head-room space is occupied by useful equipment rather than being idle.
5. Ventilation and exhaust problems are usually less expensive to install on this type of equipment.

His speech was followed by the usual open discussion with many of the members.

One of the visitors attending was *Mr. Henry Mahlstedt*, of the United Chromium Corp., New York. Announcement was made of the coming Chicago Technical Conference to be held on March 14-17 at the Hotel Stevens, and also the Electroplating course at the Illinois Institute of Technology, which began its second term on February 17th.

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CONVEYORIZED PERFORMANCE!

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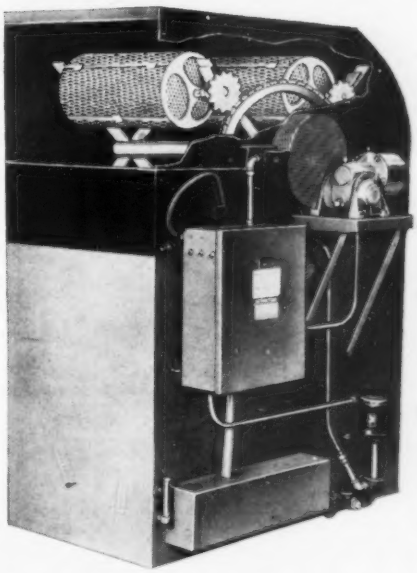
No installation costs!

PHILLSOLV . . . the perfect cleaning solvent for all metals or combinations of metals. PHILLSOLV will not affect or stain highly polished surfaces.



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Send for FREE Booklet "Questions and Answers on Vapor Degreasing"

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Baltimore-Washington Branch

The February meeting of the Baltimore-Washington Branch was held at the *Crown Cork and Seal Company's* plant in Baltimore on February 8th.

A dinner was served to over 150 members and guests through the courtesy of the host company. The dinner was followed by a tour through the Closure Division, where operations pertaining to cold reduction of strip steel, vertical continuous steel annealing, skin pass reduction, continuous electrolytic tin plating, continuous sheet lacquering, lithographing, closure shell forming, and closure assembly were observed.

Then the Machinery Division was visited. Here operations pertaining to grinding, buffing, plating, heat treating, machinery painting, and assembling of carbonators, soft drink and beer bottling machines were observed.

Details of the trip were arranged by our members *Charles Glock*, Metallurgist in the Closure Division, and *Phil Wright*, Superintendent of Finishes in the Machinery Division. The Branch was welcomed to the plant by *James Wray*, General Manager of the Machinery Division.

Louisville Branch

At a special dinner meeting held on Saturday, February 19th, at Bauer's Park just outside of Louisville, *Mr.*

William J. Neill, Second Vice-President of the American Electroplaters' Society, presented the newly formed Louisville Branch with a permanent charter.

The meeting was attended by a large majority of the local members, and such noted guests as *Mr. Ed Bruck*, President of the Indianapolis Branch, and *Mr. Donald L. Patrick*, former Louisville Branch President before his transfer to Indianapolis. Also present were guests from Cincinnati, as well as some of the wives of the members.

The presentation was inspiring, especially to new American Electroplaters' Society members; the food and drinks were excellent and a wonderful time was had by all.

Los Angeles Branch

The Los Angeles Branch of the American Electro-Platers' Society held its annual election at the March 9 meeting in Sculley's Cafe, Los Angeles, with the following results:

President; *Allan Sulzinger*, Hughes Aircraft Corp.

1st vice-president; *Richard Wooley*, Pacific Coast manager, United Chromium, Inc.

2nd vice-president; *Roy Lostutter.*

Librarian; *Robert McDonald.*

Secretary; *Myron Orbaugh.*

Treasurer; *Walter Behlendorf.*

The new board of managers consists of *Frank Bunker*, the retiring president, as Chairman, *Earl Coffin* and *Don M. Bedwell.*

Messrs. Bedwell, Wooley and Charles Russill were named as delegates to the Milwaukee national convention, with Marcus Rynkofs and Jack Raskin as alternates.

President-elect Sulzinger obtained a bit of pre-inauguration experience in conducting the meetings when he was called upon to serve as chairman at the March meeting, in the absence of President Frank Bunker, who was reported quite seriously ill.

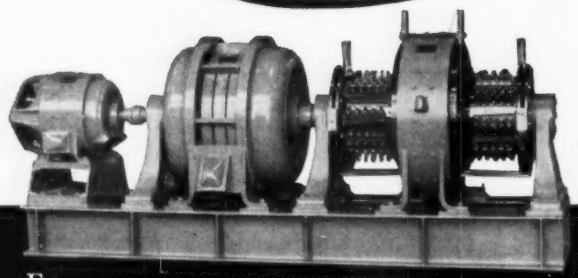
Visitors introduced included *Ted Ralston, O. J. Jacobson* of the J. J. Siefen Co., *Roy Darling* of Behr-Manning Co., and *W. Sorenson* of Kelite, Inc. The latter two subsequently were inducted into membership.

General chairman Bedwell announced he had made the following committee chairmanship appointments to handle advance details for the 1951 AES convention in Los Angeles: Finance, *Howard Woodward*; registration, *Peter Rogers;* Education, *Myron Orbaugh;* hotels, *Herold Kroesche;* program, *Stuart Krentel;* entertainment, *Bud McDonald;* publicity, *Robert Longacre;* banquet, *Ed Wells;* luncheon, *Stanley Rynkofs;* outing, *John Millhorn;* exhibits, *C. Tarzinsky;* Ladies committee, *Mrs. Marcus Rynkofs;* sightseeing tours, *Marcus Rynkofs.*

The announcement at the March meeting which received the most enthusiastic applause was one given by *Jack Raskin*, chief of the plating supply division of the L. H. Butcher Company, in which he conveyed the Butcher Company's invitation to hold its May meeting as dinner guests of the firm in its employee cafeteria. This is the third successive year the L. H. Butcher Co. has hosted the entire branch at one meeting a year.

Announcement was made of the passing on February 25th of a nationally known figure in the plating and plating supply business, *Carl Dennis*, head of the metal finishing division of the Los Angeles Chemical Co.

Motor Generators by COLUMBIA



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Electroplating — Anodizing
Electrocleaning — Electropolishing

There's a Columbia M-G Set available for your needs, whether you have a small plating bath or a large continuous strip plating line. Capacities up to 20,000 Amperes; 6 Volts and up. Dependable, performance proved, for many years. Your inquiries solicited.

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COLUMBIA ELECTRIC MFG. CO.
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FELT WHEELS
TOPS IN Versatility

There's a Paramount Brand Felt Wheel to meet your polishing requirements. Here are a few of the more important applications: as a grease set-up wheel, as an oil wheel, as a dry wheel, as a greaseless wheel, as a buffing wheel, as a lapping wheel, and as a contact wheel for belt polishing.

. . . And Paramount Brand Felt Wheels are better because they hold desired edges and shape throughout wheel life, because they have several times the life of built up wheels, because they have uniform density which provides greater head life and because they provide a particularly fine surface for bright plating.

SEND FOR NEW COMPLETE CATALOG

BACON FELT COMPANY
Established 1824
WINCHESTER "America's Oldest Felt Manufacturer" MASSACHUSETTS Felt Does It Better

Twin City Branch

The Twin City Branch of the American Electroplaters' Society met on Monday, March 7th, in the Penthouse of the Covered Wagon, Minneapolis. There were thirty-three persons present.

An informal lecture was given by *Bob Buckley* of Industrial Chemical and Equipment Company on "The Finishing of Zinc Base Die Castings," at which time the various methods of finishing were described and samples shown. Following the lecture, a round-table discussion was held on this subject and was led by *Jerry Weller*, of Brown and Bigelow, Inc.

President *Frank Ireland* of Brown and Bigelow called the meeting to order following the dinner. The first matter of business was the introduction of guests who were: Messrs. *Gerald C. Peterson*, of Revere Copper and Brass, Inc., and *Bob Hawkins*, of Hawkins Chemical Co.

A new member, *John Flekke* of George T. Walker Company was introduced and welcomed into the branch. *Mr. W. J. Miller* of Detrex Corp., who is a member of our Branch and now is located in Chicago, was present at this meeting and welcomed back by President Ireland. *Eric Presser* of LaSalco, Inc., was welcomed back as he has been laid up for some time with a finger and eye injury.

Mr. E. H. Lindemann, of Minneapolis Honeywell Regulator, Chairman of the Nominating Committee, was called on next by President Ireland. The report of the Nominating Committee was as follows:

President: Clifford A. Bowman, Minneapolis Honeywell Regulator Co.

1st Vice-Pres.: Al Joyner, The Silver Shop.

2nd Vice-Pres.: D. Wray Schorr, Hiawatha Metalcraft Co.

Secy.-Treas.: Robert L. Buckley, Industrial Chemical & Equipment Co.

Librarian: Gunnar Deedon, Turco Products, Inc.

It was motioned and seconded that the above slate of nominees be accepted and further nominations be closed. Following the passage of this motion the Secretary was instructed to cast a unanimous ballot for the above officers. The new officers will take over their new positions at the April meeting.

Following the business meeting, the meeting was turned over to *Mr. D. Wray Schorr*, the Branch Librarian, who introduced *Mr. Leroy Camel*, General Industrial Sales Manager of the Detrex Corporation, who spoke on "Vapor Degreasing and the History of Degreasing Solvents." Mr. Camel's talk was not only interesting, but also enlightening, as it brought out many things concerning solvents which interested many of those present.

New York Branch

The Annual Open Meeting and Banquet of the New York Branch of the American Electroplaters Society was held at the Statler Hotel on Saturday Feb. 26th. The afternoon technical sessions were attended by close to 100 persons, while the evening banquet and entertainment was thoroughly enjoyed by over 300 members and their guests.

The first speaker at the technical

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Send me the new catalogue—"Alsop 'Sealed-Disc' Filters for Plating Solutions."

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sessions was *Mr. Edwin Rinker*, of *Bart-Messing Corp.*, who spoke on Gold Plating. Mr. Rinker expressed the fact that the simplest formulas for gold plating baths were the easiest and best from the standpoint of control and maintenance, and he listed several typical formulas and operating conditions. He also discussed the advantages of periodic reverse plating on the evenness of the deposited metal, and showed several interesting samples of parts plated in this manner. His preference was for stainless steel anodes in all gold work, as gold anodes had a tendency to produce rough plating. The effects of gold concentration on the cathode efficiency were illustrated, and practical hints given for making up gold coloring baths.

Mr. Harold Narcus, Technical Director of *Electrochemical Industries*, spoke on the theory and practical applications of metal evaporation methods, and showed a number of interesting sample parts. The question period following his talk indicated that the speaker had created a great deal of interest in this new process of metallic surfacing.

The final speaker on the program was *Mr. Kenneth Huston*, Research Engineer for *Armco Steel Corp.*, and a past Supreme President of the American Electroplaters Society, who talked on the electropolishing of stainless steels. An outstanding feature of Mr. Huston's talk was the large number of samples which he passed around to illustrate the various points brought out in his talk. This is an example which could be followed profitably by future speakers, and Mr. Huston's command of the subject and excellent method of presentation provided a fitting climax to an excellent technical session.

The Annual Banquet was held in the Manhattan Room, where an excellent roast turkey dinner was supplemented by professional entertainment and dancing to round out the day's activities. A feature of the entertainment was the short and snappy speech made by *Joe Brust*, of the New York branch.

Among those present were a large delegation from the village of Newark, N. J., who came over to get first hand information on running an annual affair of this kind.

Baltimore-Washington Branch

The regular March meeting of the Branch was held at the Dodge Hotel on the 8th. About 50 members attended.

Mr. S. S. Johnston, President of the American Electroplaters' Society and Technical Director of the Tin Mill, Electrolytic Department, of the Weirton Steel Company, showed a very interesting film of the manufacture of tin plate at the Weirton Steel Co. After the film, he discussed and answered numerous questions about the tin plate processes

Three new members were elected, as follows:

John P. Young, National Bureau of Standards.

Reginald Biser, Everedy Company, Frederick, Md.

Melvin R. McChesney, Oakite Products, Inc.

National Association of Corrosion Engineers

Engineers and management specialists interested in attending a short

IMPROVED FINISHES . .
WITH THIS
PRODUCTION TYPE 101
— CENTERLESS —
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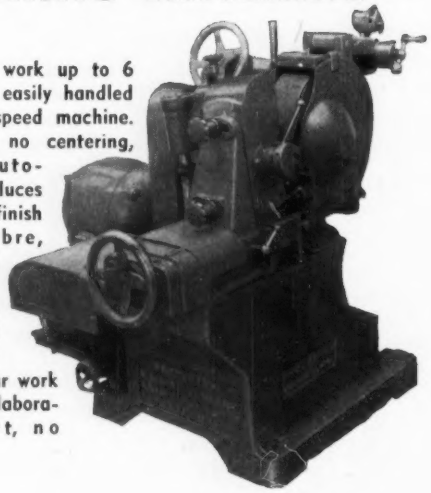

• Cylindrical work up to 6 inch diameter easily handled on this high speed machine. No chucking, no centering, just feed automatically. Produces high quality finish on metal, fibre, plastic, and many other materials using unskilled labor. Send us samples of your work for complete laboratory report, no obligation.

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Cleanse and Purify Zinc Solutions with

McKeon's Zinc-Brite
TRADE MARK REG'D.

Save on "Brightener"
Sample FREE

Sulphur Products Co. Inc.
Greensburg 7, Pa.

course in corrosion engineering are invited to write *Nathan Schofer*, Cities Services Refining Corp., The Tutwiler Refinery, Lake Charles, La. Mr. Schofer is chairman of a committee named by the South Central Region NACE to get a consensus on the proposed course, and if sufficient interest is evidenced, make arrangements with a university engineering school to hold it this year. Letters expressing interest should define the specific aspect of corrosion in which the writer is interested, forecast the number likely to attend, the most suitable time it should be held, and give any other pertinent comments.

Initial consideration of the proposed course developed the idea it would be directed in general toward a review of fundamentals, rather than application. Areas under consideration include electrochemistry, corrosion fundamentals, cathodic protection, metallurgy and inhibition.

While specific organization has not been defined and will not be determined finally until expressions from those interested have been considered, plans include possible use of a series of lectures originally given at a short course on corrosion at the Stevens Institute of Technology and presentation of subjects by qualified specialsits from industry, with or without supplementary assistance from the teaching staff of the university selected.

The one or two weeks' course may be attended by about 200, and fees covering cost of the program are contemplated.

Manufacturers' Literature

Oakite 40th Anniversary Bulletin

On the occasion of its 40th Anniversary in the metal cleaning and finishing field. *Oakite Products, Inc.*, 26 *Thames St., New York, N. Y.* have published a booklet describing the activities and growth of the company. The story of how the firm trains its field representatives to render prompt and efficient service to its customers is clearly revealed, and numerous photos show these men at work in the customers plants. Included is a complete list of technical service representatives in both this country and abroad.

Plating Supply Prices

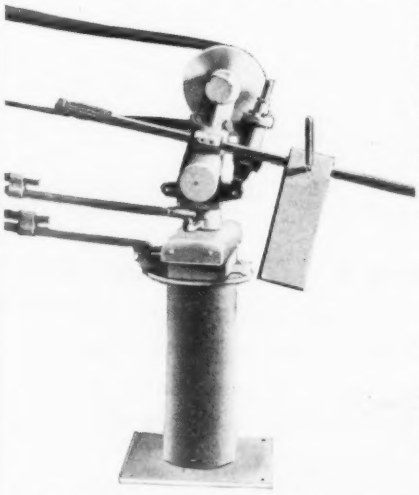
The latest price list issued by the *Udylite Corp., Detroit, Mich.* on their plating and polishing supplies indicates a slight rise in the cost of many items. Principle among those for which prices have risen are copper, zinc, and cadmium ball anodes; lead anodes; boric acid; chromic acid; copper, sodium, and zinc cyanides; potassium and sodium dichromate; and trichlorethylene. The price of caustic soda in drum lots has dropped ½ cent per lb.

Brush-Backed Sander and Polishing Wheel

Vonnegut Moulder Corp., Dept. MF, 1811 *Madison Ave., Indianapolis, Ind.*

New bulletins just released by this firm describe their brush-backed sander and abrasive head for use in the preparation of metal, wood, and plastic surfaces. The wheels feature replaceable abrasive strips, available in all

Niederst Back Stand Idler
DESIGNED AND BUILT FOR
FASTER—SMOOTHER POLISHING
plus
VERSATILITY



Backed by eighteen years experience in the abrasive polishing field, the NIEDERST BACK STAND IDLER offers the utmost in both dependability and productiveness.

Features include:
Bearing Speed Reduced 33%
Accurate Belt Tension
Interchangeable Idler
Dual Remote Control Operation

Write for Specification Sheet and information for introducing belt polishing on your present lathe equipment.

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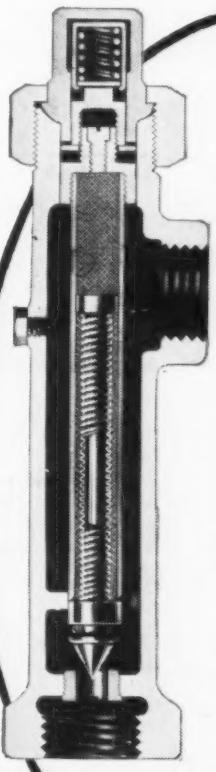

Steam Trapping Out-of-Doors

THE SARCO No. 87

The Sarco No. 87 illustrated is intended particularly for draining long steam lines and high pressure heating coils where condensate cannot be returned to the boiler. It can be adjusted to deliver a continuous stream of condensate at temperatures below 212° F. so that no steam is wasted by re-evaporation.

The same trap is also furnished for use as an inexpensive temperature regulator in connection with process steam heated equipment and tanks heated by steam coils. Catalog 250 and 550.

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SARCO SAVES STEAM
SARCO COMPANY, INC.
Empire State Bldg., New York 1, N.Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

grits, and up to 4" wide, backed by sections of brush, making these wheels particularly adaptable to the polishing and sanding of irregular and curved surfaces. The firm also manufactures a line of lathes for polishing and buffing work.

Purity Meter for Water

Barnstead Still & Sterilizer Co., Dept. MF, 2 Lanesville Terrace, Boston 31, Mass.

A new bulletin issued by this firm describes apparatus for making quick check-tests for purity of distilled or demineralized water. Of the many features described, probably the most important are the speed of testing—only 30 seconds; the simplicity of operation—no technical training needed; and the fact that readings are given directly as ppm. of total solids of impurity as sodium chloride. Other features are the double temperature scale (Fahrenheit and Centigrade), and the conversion table which instantly translates ppm. of impurities into ohms (resistance) or micro-mhos (conductance). The bulletin also describes several accessories for the Purity Meter. Copies available on request to above address.

Degreasing Machines

Optimus Equipment Co., Dept. MF, 21 Water St., Matawan, N. J.

A new bulletin issued recently by the above firm describes their line of vapor degreasing machines, which includes many sizes and types of single units as well as conveyorized machines. All Optimus degreasers are fitted with complete automatic controls, water separators, and heating means. Models are available for steam, gas, or electric heating, and are made of heavy gauge zinc-coated or stainless steel. Copies of this bulletin are available on request to the above address.

Liquid Addition Agent for Copper Plating

MacDermid Incorporated, Dept. MF, Waterbury 88, Conn.

This firm announces a new technical data sheet on Rocheltex, their liquid addition agent which can be added to any cyanide copper plating solution and used in any type of equipment.

This concise, yet complete, bulletin shows how plating costs are reduced by the addition due to the reduction of cyanide additions required and by retarding the carbonate build-up. It also states that Rocheltex aids in producing brighter, more uniform copper deposits at high current densities.

According to the manufacturer, semi-bright lustrous deposits are obtained which are easily buffed, or in many cases may be bright nickel plated without buffing. Nickel deposits over Rocheltex copper are brighter and of more uniform color due to the fine uniform grain size of the copper deposited at all normal current densities, it is claimed.

Manufacturers of copper plated articles should find this data sheet of particular interest as it gives the typical formulas as well as operating conditions and other typical applications. Copies will be mailed without obligation.

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AT LAST
YOU CAN SETTLE
POLISHING PROBLEMS
PERMANENTLY
Heavy Duty Ball Bearing Polishing Machine. V Belt Drive—from 5 to 10 H.P. Motors can be either inside or outside of base.
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HAVERHILL, MASSACHUSETTS

Public Relations Guide

Metal Trades Association, 122 S. Michigan Avenue, Chicago 3, Illinois.

"Open House In Industry," the practical manual on industrial-community-relations entertaining, is available again. A new large printing has resulted from the unprecedented demand for the 36 page publication, originally planned for the members of the 49 year old industrial relations organization, but offered to management generally after hundreds of requests had been received. It can be secured for $1.00 a copy.

"Open House In Industry" is one of a series of practical studies prepared by the N.M.T.A. on what manufacturing plants are doing to improve their industrial and community relations. The publication outlines practical methods of planning and conducting three types of open house—Special Guest Days (invited groups, such as conventions, clubs, schools, etc.), Family Day (for employees and their families), and Community Day (where the entire community is also invited).

Among important subjects discussed are: the purpose of the open house, when to hold the affair, whom to invite, responsibility for arrangements, public relations arrangements, traffic and transportation, reception of guests, exhibits, plant tour procedures, refreshments, plant protection, safety and first aid, and cleaning up the plant before and after the open house. The book is generously illustrated, and based entirely on the current practical experience of manufacturing plants.

Designing V-Belt Drives

U. S. Rubber Co., Dept. MF, Rockefeller Center, N. Y. 20, N. Y.

The mechanical goods division, United States Rubber Company, has published a 100-page manual to assist engineers in designing both multiple and light duty V-belt drives.

The manual contains a comprehensive set of drive tables for multiple belts; complete sheave data including construction, dimensions, and weights; complete fractional horsepower drive layouts; comparison tables with information on quater turn drives and hexagon double V-drives.

Detailed information on U. S. Royal super-service V-belts, U. S. Rainbow steel cord belts, standard U. S. Rainbow V-belts with equal-tensil cord section is also contained in the manual.

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FOR NICKEL PLATING
The one bath especially designed for plating diecastings made of WHITE METAL ALLOYS including ZINC, LEAD, and ALUMINUM. ZIALITE also plates on COPPER, BRASS, and IRON.
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ADDITION AGENTS
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HARD CHROMIUM BATHS
Finer-grained deposits.
Increased throwing power.
Less sensitivity to sulfate content.
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A NEW NAME IN INDUSTRY
A NEW APPROACH TO FINISHING EFFICIENCY
"GREATER NUMBER OF UNITS PER DOLLAR" with
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...according to AMER-CRAFT customers...
WE ARE BUILDERS of BETTER BUFFS
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Made in diameters from 2½" to 8" of brass, steel or nickel silver wire in sizes .0025-.006.

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DIXON & RIPPEL, INC. KINGSTON, N. Y.
Established 1856

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STRIPODE
TO STRIP NICKEL
★ Cuts acid consumption ★ Reduces pitting and roughening
★ Protects base metal ★ Minimizes need for buffing and coloring
WRITE RIGHT NOW FOR MORE INFORMATION
THE CHEMICAL CORPORATION
54 Waltham Avenue
SPRINGFIELD • MASSACHUSETTS

News from California

W. B. Merriam has been elected president of *Globe Products Mfg. Co., Los Angeles*, manufacturers of a line of buffers, grinders, lathes, turrets and screw machines.

R. E. Lockard, sales manager for the past two years, has been elected vice-president in charge of sales; and *Thomas McArdle*, formerly with the Lyon Company, Burbank, Calif., has been appointed head of the contract division, which produces parts and sub-assemblies for the aircraft and other industries.

Turco Products, Inc., Los Angeles, manufacturers of specialized industrial chemical compounds, announce two additions to the staff of the Development and Control Division—*Donald F. Steiner* and *Richard Loftfield*.

Steiner, a graduate of the University of California at Los Angeles, also spent two years at California Institute of Technology on an American Petroleum Institute Fellowship. He was previously connected with Easton Chemicals, Inc., doing research on phosphates, insecticides and thiophosphates.

Loftfield graduated from Ohio State University with a bachelor of chemical engineering degree and followed with a year in chemical engineering work at Michigan State College. He had previously been engaged in chemical engineering with the Harshaw Chemical Co. at Cleveland, O.

Russell C. Hedeen, head of the R. C. Hedeen Co., San Francisco, distributors of buffs, polishing materials and plating supplies, returned in mid-February from an extended eastern business trip which included visits to Chicago, Detroit, Pittsburgh, Jersey City, New York City and Utica, N. Y.

Eugene Lapin of 868 North Oak Avenue, Temple City, Calif., has been named sales engineer for the Hedeen Co. in the Los Angeles area. *Cliff Brusseau* handles the northern California territory.

Perfecto Mfg. Co., 921 *East Pico Blvd., Los Angeles*, has installed a new rotary buffing machine to meet the needs of the firm for buffing the metal

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Viking	86-93	2.60

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parts of Silex coffee machines. The firm operates an aluminum metal working shop for the manufacture of the Forty-Niner line of Silex units. In addition to the new rotary automatic, the shop contains two standard polishing lathes. *Mr. Joseph Glug* is superintendent of the metal working and buffing shops.

WESTERN METAL EXPOSITION

(*Concluded from page* 48)

DEARBORN CHEMICAL CO. B-121
310 *S. Michigan Ave. Chicago, Ill.*
Cleaners and rust preventives.

DETREX CORP. 524
Detroit 32, *Mich.*
Vapor degreasing equipment.

DIVERSEY CORP. B-212
53 *W. Jackson Blvd. Chicago, Ill.*
Metal cleaners and compounds.

HAMMOND MACHINERY BUILDERS, INC. 224
1603 *Douglas Ave. Kalamazoo* 54, *Mich.*
Polishing and buffing machines.

HOBART BROS. CO. 303
1221 *Hobart Rd. Troy, O.*
Motor generators.

E. F. HOUGHTON & CO. 333
303 *W. Lehigh St. Phila.* 33, *Pa.*
Cleaners and rust preventives.

INTERNATIONAL NICKEL CO. 229
67 *Wall St. New York, N. Y.*

KELITE PRODUCTS, INC.
909 *E. 60th St., Los Angeles, Calif.*
Industrial chemicals.

CHAS. F. L'HOMMEDIEU & SONS, INC. 225
4521 *Ogden Ave. Chicago* 23, *Ill.*
Plating equipment and supplies.

NORTON CO. 213
50 *New Bond St. Worchester, Mass.*
Abrasives and tumbling compounds.

OAKITE PRODUCTS, INC. 120
26 *Thames St. New York, N. Y.*
Cleaners and detergents.

PANGBORN CORP.
Hagerstown, Md.
Blast cleaning equipment.

SPAR-TAN ENGINEERING CO.
Los Angeles, Calif.
Lubri-Chrome process.

VAPOR BLAST MFG. CO. B-222
3025 *W. Atkinson St. Milwaukee, Wisc.*
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POLISHING
RUST PROOFING
CLEANING
ANODIC TREATMENT
ETC.

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6 Baird Tilting Tumblers No. 1c and No. 2c
20 Semi Automatic Buffing Machine Attachments
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